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REAC

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
EPA
RESPONSE TEAM

OFFICE OF EMERGENCY AND REMEDIAL RESPONSE

[redacted]

97P-1159

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SUBJECT: DOCUMENT TRANSMITTAL UNDER WORK ASSIGNMENT 3-367

Attached please find the following document prepared under this work assignment:

FINAL REPORT
Naples Truck Stop Site
Field Investigation

cc: Central File - WA 3-367 (w/attachment)
Edward F. Gilardi, REAC Program Manager (w/o attachment)

FINAL REPORT
Naples Truck Stop Site
Field Investigation
Naples, Uintah County, UT
April 1999

U.S. EPA Work Assignment No.: 3-367
WESTON Work Order No.: 03347-143-001-3367-01
U.S. EPA Contract No.: 68-C4-0022

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TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 Objective

The objective of this project was to assist the U.S. Environmental Protection Agency (U.S. EPA) Environmental Response Team Center (ERTC) with the evaluation of soil and associated phytoremediation activities using Siouxland poplar trees at the Naples Truck Stop site in Naples, Utah. Phytoremediation was selected to remove the residual volatile organic compound (VOC) contamination present at the site and to control the contaminant plume.

1.2 Site Description

The Naples Truck Stop is located on U.S. Highway 40 between 1500 Street South and 1700 Street South in a light industrial/commercial area of the Ashley Creek Valley (Figure 1). Groundwater flow is generally toward the southeast and groundwater elevations rise and fall significantly due to seepage from irrigated fields and canals (E & E 1994). An intermittent stream is located less than 250 feet (ft) south of the site which flows due east toward Ashley Creek, approximately 1.75 miles east of the site (E & E 1994).

In late 1993, gasoline triggered an alarm installed by Questar to monitor the integrity of their underground fuel storage tank. Questar is a trucking company located adjacent to the Naples Truck Stop. Integrity testing of Questar lines and underground storage tanks indicated that the tanks and lines were intact and it was concluded that gasoline contamination was from an off-site source. Testing surrounding properties confirmed a leak was present in one of the underground storage tank lines on the adjacent Naples Truck Stop property.

The US EPA Region VIII's Technical Assistance Team (TAT) defined the plume and installed monitoring wells. The U.S. Army Corps of Engineers was contracted to install an Enhanced Vapor Extraction System (EVES) to recover free product, groundwater, and soil gas. Since then, contaminant levels (primarily benzene, toluene, ethylbenzene, and xylenes [BTEX]) have plateaued and either increased/decreased erratically.

Phytoremediation is the use of vegetation for the *in-situ* treatment of contaminated soil, sediment, and groundwater and was seen as a way to remove the residual contamination and control the plume. The Response, Engineering, and Analytical Contract (REAC) was mobilized by the U.S. EPA to characterize the soil in areas prepared for phytoremediation activities.

1.3 Scope of Work

The project involved the collection and analysis of subsurface soil samples from six locations on-site and one location off-site. Subsurface samples were collected because this is the soil that would be in contact with the tree roots. The samples were submitted for a variety of chemical and agronomic analyses. The analytical data was used to evaluate potential adverse effects associated with site specific contaminants and to determine if soil characteristics were compatible with the growth requirements of the trees.

2.0 METHODS

2.1 Sampling Locations

The study area was divided into six on-site locations and one off-site reference location (Figure 2). Locations were as follows:

Location 1 - An area of approximately 2,350 square feet, situated outside of the plume.

Location 2 - An area approximately 11,300 square feet, situated inside the plume.

Location 3 - An area approximately 7,000 square feet, situated at the leading edge of the plume.

Location 4 - An area approximately 6,800 square feet situated at the leading edge of the plume.

Location 5 - An area approximately 4,200 square feet, situated outside of the plume.

Location 6 - Reference area located on 4000 St. S and 500 St. W.

Location 7 - Clean fill randomly collected throughout the planting areas.

2.2 Soil Sampling

During the week of October 26, 1998 the contractors hired to plant the trees dug a trench the length and width of each sampling area to a depth of 2 ½ feet. The contaminated soil was removed and replaced with clean soil. When REAC arrived on November 2, 1998 the Task Leader requested that the individuals preparing the holes for tree planting dig a limited number of holes through the fill layer and into the native soil material, prior to digging all the holes for the trees. This was to facilitate the collection of soil samples.

Except for the reference sample, each sample consisted of a composite of subsamples collected from several locations within each area. The number of subsamples was a function of the size of the area with one subsample collected for every two thousand square feet (Table 1). Three rows of holes were prepared for planting trees. The samples were collected from holes dug for the trees at a depth of approximately 4 feet and any clean soil that may have sloughed into the hole was removed to expose the native soil. All subsamples were collected from the middle row of holes and the holes were approximately equidistant from each other. So as to keep the sampling areas discrete, subsamples were not collected close to the isopleth boundaries.

Soil was collected per ERTC/REAC Standard Operating Procedure #2012, *Soil Sampling,* using an auger or a post-hole digger. Samples from Locations 1 and 2 were collected using an auger, homogenized in a 2 ½ gallon bucket and distributed into the appropriate sample containers. Samples from Locations 3, 4, and 5 were collected using a post-hole digger, were homogenized in a 2 ½ gallon bucket, and were distributed into the appropriate sample containers. The reference location (Location 6) consisted of one discrete sample collected using a post-hole digger. The clean soil sample (Location 7), which will be referred to as fill, was collected from twenty five subsample locations distributed uniformly throughout the planting areas.

3.0 RESULTS

The complete analytical results for chemical, agronomic, and microbiology analyses can be found in Appendices A, B, and C, respectively. Following is a discussion of these results.

3.1 Soil Sampling Results

3.1.1 Target Analyte List (TAL) Metals

The metals contributing most significantly to the total metal burden at all locations included aluminum, calcium, iron, magnesium, and potassium (Table 2). These metals are typically found in soil and were within normal ranges for the area (Boerngen and Shacklette 1981; Shacklette and Boerngen 1984). The concentrations of metals found on site were generally higher than the concentrations of metals found in the reference location (Location 6) and in the clean fill (Location 7). There were no trends noted in the metal concentrations.

3.1.2 Volatile Organic Compounds

Acetone and 2-butanone were detected in soil (Table 3). Acetone was detected in four of the locations ranging from 0.05 to 0.43 mg/kg and 2-butanone was detected in Location 4 at a concentration of 0.01 mg/kg. There were no VOCs detected in the reference location.

3.1.3 Polychlorinated Biphenyls and Pesticides

Polychlorinated biphenyls and pesticides were not detected in soil samples collected from the site.

3.1.4 Herbicides

Herbicides were not detected in soil samples collected from the site.

3.1.5 Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPHs) were found in the sample collected from Location 1 at a concentration of 44 mg/kg (Table 4). A petroleum odor was detected during collection of one of the grabs from Location 2, however, no TPHs were detected in this sample.

3.1.6 Agronomic Analysis

The agronomic analyses consisted of many chemical and physical parameters. The chemical parameters included nitrogen compounds, available macronutrients, and available micronutrients, chloride, sulfate, pH, lime requirement, acidity, cation exchange capacity, soluble salts, and total organic carbon (Table 5). The physical parameters included water holding capacity, specific gravity, textural class, and grain size. No discernable trends were noted in the data.

3.1.7 Microbiology

The mean concentrations for NH_4-N at day 0 and day 42 ranged from 0.195 to 0.73 µg NH_4/g soil, and 0.11 to 2.19 µg NH_4/g soil, respectively (Table 6). Initial concentrations (day 0) of NH_4-N were relatively low at all locations. During laboratory incubations, the

net change in NH_4-N concentrations was relatively small. At Locations 1 and 7 there was a net decline in the NH_4-N concentrations and a net increase at all other locations.

The mean concentrations for NO_3-N at day 0 and 42 ranged from 0.22 to 10.12 µg NO_3-N/g soil, and 1.66 to 12.17 µg NO_3-N/g soil, respectively. Nitrate concentrations varied considerably between locations and increased substantially after laboratory incubation of soils from Locations 3, 6, and 7.

The mean concentrations for dissolved organic nitrogen (DON) at day 0 and 42 ranged from 0.00 to 2.24 µg DON/g soil, and 0.00 to 0.02 µg DON/g soil, respectively. Dissolved organic nitrogen concentrations decreased at all locations except Location 4, where there was no DON detected.

The mean concentrations for microbial biomass nitrogen (MBN) at day 0 and 42 ranged from 0.00 to 20.05 µg MBN/g soil, and 0.89 to 26.61 µg MBN/g soil, respectively. Microbial biomass nitrogen concentrations increased or remained stable during laboratory incubation.

Dissolved organic carbon (DOC) concentrations at days 0 and 42 ranged from 79.35 to 170.25 µg DOC/g soil, and 90.15 to 216.53 µg DOC/g soil, respectively (Table 7). Dissolved organic carbon concentrations did not change dramatically during soil incubation but at Locations 2 and 6 DOC decreased. Microbial biomass carbon (MBC) concentrations at day 0 and day 42 ranged from 6.69 to 361.24 µg MBC/g soil, and 214.33 to 821.58 µg MBC/g soil, respectively. Microbial biomass carbon increased at all locations. Soil respiration was determined by taking CO_2 measurements from incubating soils on a weekly basis. The mean concentrations for CO_2 ranged from 33.37 to 351.81 µg CO_2/g soil. The lowest concentrations were found at Location 1 and the highest concentrations were found at the reference location (Location 6).

Uptake of carbon and nitrogen by microorganisms varied among sites. In Locations 1, 2, 3 and 6, both carbon and nitrogen concentrations in microbial biomass increased greatly during soil incubation. However, in Locations 4, 5 and 7, MBC increased while MBN concentrations remained approximately the same or declined slightly. In uncontaminated systems, microbial growth is typically limited by carbon availability. These results suggest that microbial growth in Locations 1, 2, 3 and 6 was limited by the availability of carbon and nitrogen sources, while microorganisms in Locations 4, 5 and 7 lacked primarily carbon for growth.

Soil enzyme analyses were conducted to determine the activity of dehydrogenase and *b*-glucosidase enzymes in soil samples collected (Table 8). Dehydrogenase activity for day 0 and 42 ranged from 0.93 to 3.95 µg triphenylformazan (TTF)/g soil and 1.67 to 8.54 µg TTF/g soil, respectively. *B*-glucosidase activity for days 0 and 42 ranged from 0.33 to 24.50 µg PNP/g soil and 4.44 to 52.64 µg p-nitrophenyl (PNP)/g soil, respectively. Dehydrogenase activity increased in soil from all locations except Location 4, where dehydrogenase activity decreased slightly during laboratory incubation. Dehydrogenase activity after laboratory incubation was greatest in soil from the reference location (Location 6). Soil from the reference location (Location 6) had the greatest initial *b*-glucosidase activity, while the lowest initial enzyme activity was observed at Locations 3 and 4.

Active fungal length and biomass were determined in soil samples prior to incubation and at the end of a 42 day laboratory incubation (Table 9). Initially, only active fungi were

detected at the reference location (Location 6). After laboratory incubation, fungal growth and biomass were detected in soils from Locations 2, 5, 6, and 7. Active fungal growth and biomass were greatest at the reference location (Location 6).

4.0 DISCUSSION

4.1 Chemical Analysis

4.1.1 Inorganics

There were no discernable trends in the TAL metal concentrations in the soil samples. Efroymson et al. (1997) published soil benchmark concentrations at which plants are expected to exhibit adverse effects. Four metals (aluminum, boron, chromium and vanadium) exceeded the benchmark concentrations. The concentrations of TAL metals in the soil were also compared to studies done by the United States Geological Survey (USGS). In 1961 the USGS conducted a survey of surficial materials distributed across the United States to determine the range of element abundance (Shacklette and Boerngen 1984). This data was compared to the site TAL metal results and with the exception of calcium, all metals are lower than the average values for the western United States (Boerngen and Shacklette 1981) and Uintah county (Table 10) (Shacklette and Boerngen 1984). A mean and standard deviation were calculated for the soil results for the western U.S. and for the current investigation (Table 11). Except for calcium, the metal concentrations in the site samples tend to be lower than the USGS samples. Furthermore, metal concentrations in the reference location were not significantly different from levels recorded on-site. These results suggest that the concentrations of metals found in the soil samples are not at concentrations that would pose a threat to plants.

4.1.2 Organics

The VOC results indicate that no BTEX compounds were detected in the soil samples. Acetone and 2-butanone were the only VOCs detected and acetone is likely attributable to the decontamination procedure. There were no trends noted in the total petroleum hydrocarbon results. Total petroleum hydrocarbons were detected in Location 1 at a concentration of 44 mg/kg. Herbicides, pesticides and PCBs were not detected in any sample.

4.2 Agronomic Analysis

Essential elements strongly influence the growth of plants and are divided into groups called macronutrients and micronutrients. Macronutrients are chemical elements used in large quantities by plants and include nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur. If these elements are lacking, slowly available, or not in appropriate balance with other nutrients, plant growth may be retarded (Brady 1974). Micronutrients are also essential for plant growth but are used in very small amounts. Micronutrients include iron, manganese, copper, zinc, boron, molybdenum, chlorine, and cobalt. Micronutrients may substantially impact growth but are required in very small amounts. Micronutrients may substantially impact growth since the availability of these elements is low and they are found sparingly in the soil (Brady 1974). Further, micronutrients are even less available to plants in alkaline soils such as those found at the site (Brady 1974). The amount and availability of nutrients to plants is a complex process and is directly related to soil characteristics and the plant species of concern. Plants can become stressed or susceptible to disease if there is not a proper balance among the nutrients, or if the nutrients are not present in sufficient quantities, or in a form available to the plant. The agronomic results suggest that the nutrients may

not be in proper balance for the optimum growth of trees. For example, the concentrations of phosphorus and potassium were low relative to magnesium in all samples except the reference location and the fill sample. In addition, the calcium concentration ranged from medium to high in Locations 1 through 5 and were excessive in the reference location and the fill sample.

Soil pH significantly affects nutrient cycling and nutrient availability (Figure 3). The pH of soil from an arid region usually ranges from 7 to approximately 9. The site receives less than 20 inches of rain annually and is considered arid (Terry 1997). The soil pH of the site ranges from 8.0 to 8.4, indicating that these soils are slightly alkaline. The Natural Resources Conservation Service (NRCS) collected soil samples in the Naples Truck Stop area and the reference area (Table 12). The pH for the samples of this investigation fell within the range of pH listed in the NRCS report (NRCS 1999).

A number of relationships exist between pH and the availability and concentration of nutrients. For example, manganese and iron deficiencies can occur in over-limed sandy soils or alkaline arid region soils. Copper and zinc availability declines above a pH of 7. On the other hand, molybdenum availability increases as the pH is raised above 6. The leaching of calcium is negligible in arid regions, therefore calcium is likely to be present in abundance especially in the subsoil. Excess calcium may hinder phosphorus absorption and utilization of plants at pH values above 7 (Brady 1974). At a pH of 8 the ionic form of phosphorus available to plants is HPO_4^{-2}. This particular ionic form of phosphorus is not as readily available to plants as some of the other ionic forms (Brady 1974). Based on this information, the high pH of the soil from the Naples Truck Stop may be limiting the availability of essential nutrients to plants. Therefore, the soil may need to be amended to lower the pH to a level optimal for plant growth.

Epstein (1965) lists the concentrations of elements sufficient for optimal plant growth. The concentration of nitrogen, potassium, magnesium, phosphorus, boron, manganese, zinc and copper in the soil samples from Naples Truck Stop were lower than Epstein's concentrations, and the concentrations of calcium and molybdenum were higher than Epstein's concentrations (Table 13.) Therefore the concentrations of elements in the Naples Truck Stop samples may not be in the range for optimal plant growth.

4.3 Microbiology Analysis

4.3.1 Nitrogen Analysis

Dissolved organic nitrogen may have contributed to microbial growth and accumulation of N in microbial biomass. Other sources of N for microbial growth were likely N from the mineral N pools, which may account for the small net changes in NH_4-N and NO_3-N concentrations during laboratory incubation. The nitrogen released from organic matter (NH_4-N) or converted to NO_3-N by ammonium oxidizers was quickly incorporated into microbial biomass. Mineral nitrogen concentrations were low throughout the study compared to the reference location (Location 6), which suggests that much of the available nitrogen was immobilized in microbial biomass.

4.3.2 Carbon Analysis

Dissolved organic carbon concentrations increased slightly after the 42 day incubation period for every location except Locations 2 and 6. The microbial biomass carbon concentrations increased in all soils after incubation, suggesting microbial growth and accumulation of carbon in microbial cells.

4.3.3 Enzyme and Fungal Analysis

Enzyme activity is determined by adding a substrate to soil, providing appropriate conditions for substrate hydrolysis and measuring the product of the reaction. Soil enzyme activity is expressed as the quantity of enzyme-cleaved product generated per gram of soil. Active bacterial cells contain dehydrogenase enzymes, which are involved in the oxidation of soil organic matter. Dehydrogenase activity increased in soil from all locations except Location 4, where it decreased slightly during laboratory incubation. The increase in dehydrogenase activity was likely due to bacterial growth under laboratory conditions, and suggests the potential for rapid bacterial growth in soils from these sites under optimal conditions.

The enzyme *b*-glucosidase is a component of most fungal cells, and provides information on the presence of enzymes capable of hydrolyzing glycosides (components of cellulose and lignin). Laboratory incubation of soils resulted in an increase in *b*-glucosidase activity in all samples, and enzyme activity was between 30-90% greater after laboratory incubation. The increase in *b*-glucosidase activity was likely due to fungal growth, and suggests that laboratory conditions were conducive to fungal proliferation in the soils. However, when the *b*-glucosidase and dehydrogenase activities in soil from the reference location (Location 6) are compared with soils from the other locations, it was noted that, after laboratory incubation, *b*-glucosidase activity in soil from the reference location (Location 6) was four to twelve times greater than *b*-glucosidase activity in soil from the other locations. Dehydrogenase activity in soil from the reference location (Location 6) was not more than five-fold greater than dehydrogenase activity in soil from other locations. These results seem to indicate that bacterial communities in soils from all locations are capable of more rapid recovery to perturbation than fungal communities.

Initially, active fungi were detected only at the reference location (Location 6). After incubation fungal growth was detected in Locations 2, 5, 6, and 7. The increase in active fungi in soils from Locations 2, 5, 6, and 7 suggests the potential for fungal growth and activity when temperature and moisture conditions are optimal.

5.0 CONCLUSIONS

- Only acetone and 2-butanone were detected in the volatile organic compound sample results. However, the acetone can be attributed to the decontamination procedures used to clean the sampling equipment.
- Total petroleum hydrocarbons were detected at Location 1 at a low concentration. Therefore, no trends in TPH were discernable. A petroleum odor was detected during collection of one of the grabs from Location 2, however, no TPHs were detected in the sample.
- Herbicides, pesticides, or polychlorinated biphenyl concentrations were not detected in any of the soil samples.
- There were no discernable trends noted in the TAL metal results. Comparison with benchmark values suggests that the metals are not present at concentrations that would be toxic to plants.
- The results of the agronomic analyses suggest that available nutrients may not be present at concentrations optimal for plant growth.

- The results of the microbiology analyses suggest that there are low nitrogen levels and impaired microbial biomass when compared to the reference location (Location 6).

6.0 RECOMMENDATIONS

- The macronutrient and micronutrient balance should be adjusted for optimal plant growth.
- The pH should be lowered by the addition of sulphur or other means to an optimum level for plants.
- Nitrogen levels should be adjusted for optimal plant growth.

7.0 LITERATURE CITED

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TABLE 1.
Number of Subsamples Per Location
Naples Truck Stop Site
Naples, UT
April 1999

Sampling Areas	Area (ft^2)	Number of Subsamples
1	2350	2
2	11300	6
3	7000	4
4	6800	4
5	4200	3

Note: Areas within sampling locations are approximated

TABLE 2.
TAL Metals Detected in Soil
Naples Truck Stop Site
Naples, UT
April 1999

(Results Reported in mg/kg)

Metal	Location						
	1	2	3	4	5	6	7
Aluminum	5500	7700	5900	7600	8700	5200	4300
Antimony	U 0.4	U 0.39	U 0.38	U 0.39	U 0.39	U 0.38	U 0.37
Arsenic	5.1	5.3	5.6	5.1	5.3	3.1	3.7
Barium	230	150	210	240	220	160	160
Beryllium	0.37	0.51	0.4	0.47	0.49	0.4	0.31
Boron	7.1	9.9	9.6	15	12	4.2	4.2
Cadmium	U 0.4	U 0.39	U 0.38	0.39	U 0.39	0.43	U 0.37
Calcium	57000	43000	92000	75000	61000	22000	25000
Chromium	8	9.8	7.5	9.0	10	7.1	7.0
Cobalt	3.1	4.2	4.3	3.1	3.9	3.2	3.5
Copper	7.7	10	9.7	7.3	9.5	9.1	8.0
Iron	7400	9400	7500	7900	8700	7100	7500
Lead	13	9.2	5.9	5.4	6.7	7.3	6.0
Magnesium	5400	6400	7700	8400	6200	4200	4300
Manganese	150	210	200	180	160	240	200
Mercury	U 0.07	U 0.06	U 0.06	U 0.06	U 0.06	U 0.06	U 0.06
Molybdenum	1	0.75	0.71	0.62	0.73	0.51	0.45
Nickel	6.7	9.5	8.7	6.9	8.2	7.0	6.9
Potassium	1200	2100	1300	1400	1700	1700	1000
Selenium	U 0.4	U 0.39	U 0.38	U 0.39	U 0.39	U 0.38	U 0.37
Silver	U 0.27	U 0.26	U 0.25	U 0.26	U 0.26	U 0.25	U 0.24
Sodium	290	210	350	190	170	110	289
Thallium	U 0.8	U 0.78	U 0.76	U 0.77	U 0.79	U 0.75	U 0.73
Vanadium	20	20	20	21	22	13	13
Zinc	27	30	23	23	28	30	25
Total Metals	77000	69000	120000	100000	87000	41000	43000

Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 3.
Volatile Organic Compounds Detected in Soil
Naples Truck Stop Site
Naples, UT
April 1999

(Results reported in mg/kg)

Compound	Location						
	1	2	3	4	5	6	7
Acetone	U 2.3	0.05	0.05	0.43	0.06	U 2.2	U 2.1
2-Butanone	U 4.7	U 4.5	U 4.3	0.01	U 4.5	U 4.3	U 4.2

Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 4.
Total Petroleum Hydrocarbons Detected in Soil
Naples Truck Stop Site
Naples, UT
April 1999

(Recorded in mg/kg)

Location	Total Petroleum Hydorcarbons
1	44
2	U 28
3	U 27
4	U 28
5	U 28
6	U 27
7	U 27

Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 5.
Results of Agronomic Analysis
Naples Truck Stop Site
Naples, UT
April 1999

Parameter	Location						
	1	2	3	4	5	6	7
Total Kjeldahl Nitrogen (mg/kg)	200	200	200	200	200	400	200
Ammonia-nitrogen (mg/kg)	13	2.9	2.6	1.8	2.1	2.3	1.5
Nitrate-nitrogen (mg/kg)	5	16	1	13	13	2	3
Nitrite-nitrogen (mg/kg)	0.01	<0.01	<0.01	<0.01	0.03	0.12	0.02
Available Macronutrients							
Phosphorus (mg/kg)	9	22	7	8	11	85	14
Potassium (mg/kg)	82	170	150	27	63	190	74
Magnesium (mg/kg)	970	1000	1300	1100	1200	260	560
Calcium (mg/kg)	15000	15000	15000	15000	15000	5500	15000
Available Micronutrients							
Boron (mg/kg)	0.8	2.3	2	3	1.8	0.6	0.3
Manganese (mg/kg)	6.7	25	5.4	5.6	2.5	77	25
Copper (mg/kg)	0.38	1.0	0.46	0.26	0.34	1.1	0.49
Zinc (mg/kg)	3.4	1.5	0.79	0.68	0.64	1.5	1.1
Chloride (mg/kg)	140	130	160	38	25	20	110
Sulfate (mg/kg)	370	940	1100	800	420	15	99
pH	8	8	8.1	8.2	8.1	8.3	8.4
Lime Requirement	0	0	0	0	0	0	0
Acidity	0	0	0	0	0	0	0
Cation Exchange Capacity (meq/100g)	23	24	26	24	25	18	20
Soluble Salts (mmhos/cm)	0.58	0.93	1.2	0.97	0.65	0.21	0.36
Total Organic Carbon (%)	2.3	1.7	3.2	2.6	2.3	1.3	1
% Moisture	14	12	8.6	13	11	7.6	6.6
Water Holding Capacity @ 1/3 Bar (%)	15	16	17	16	17	8.9	7
Water Holding Capacity @ 15 Bar (%)	8.3	8.2	9	8.3	8.9	4.1	3.5
Specific Gravity	2.6	2.4	2.4	2.5	2.6	2.6	2.6
Textural Class	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
Grain Size							
Percent Sand	68	52	52	60	58	60	76
Percent Silt	12	44	44	36	36	26	12
Percent Clay	20	4	4	4	6	14	12

Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 6.
Results of Nitrogen Analysis
Naples Truck Stop Site
Naples, UT
April 1999

Location	Replicate	Incubation Time (d)	NH_4-N (ug/g soil)	NO_3-N (ug/g soil)	DON (ug/g soil)	MBN (ug/g soil)
1	1	0	0.55	2.60	2.17	0.00
1	2	0	0.89	2.61	2.30	0.00
Mean			**0.72**	**2.605**	**2.24**	**0.00**
1	1	42	0.20	3.16	0.00	3.97
1	2	42	0.33	2.56	0.00	3.98
Mean			**0.27**	**2.86**	**0.00**	**3.965**
2	1	0	0.63	10.01	1.47	0.00
2	2	0	0.83	10.23	0.27	0.00
Mean			**0.73**	**10.12**	**0.87**	**0.00**
2	1	42	0.82	9.72	0.00	3.16
2	2	42	0.68	9.74	0.00	4.13
Mean			**0.75**	**9.73**	**0.00**	**3.65**
3	1	0	0.43	0.44	1.04	0.37
3	2	0	0.21	0.00	1.75	0.00
Mean			**0.32**	**0.22**	**1.40**	**0.185**
3	1	42	0.66	1.59	0.00	1.44
3	2	42	0.70	1.72	0.00	0.33
Mean			**0.68**	**1.66**	**0.00**	**0.885**
4	1	0	0.39	9.58	0.00	19.10
4	2	0	0.81	9.63	0.00	17.64
Mean			**0.60**	**9.61**	**0.00**	**18.37**
4	1	42	1.05	8.72	0.00	13.77
4	2	42	1.05	8.68	0.00	12.18
Mean			**1.05**	**8.70**	**0.00**	**12.98**
5	1	0	0.24	9.90	0.00	20.27
5	2	0	0.50	10.10	0.68	19.82
Mean			**0.37**	**10.00**	**0.34**	**20.05**
5	1	42	1.05	9.68	0.00	16.12
5	2	42	0.52	10.20	0.04	14.64
Mean			**0.79**	**9.94**	**0.02**	**15.38**
6	1	0	0.80	0.97	1.18	4.90
6	2	0	0.25	0.00	1.88	2.39
Mean			**0.53**	**0.49**	**1.53**	**3.65**
6	1	42	1.79	20.83	0.00	23.40
6	2	42	2.59	3.50	0.00	29.81
Mean			**2.19**	**12.17**	**0.00**	**26.61**
7	1	0	0.20	0.55	0.62	16.38
7	2	0	0.19	0.26	1.80	10.24
Mean			**0.195**	**0.41**	**1.21**	**13.31**
7	1	42	0.06	2.63	0.00	18.22
7	2	42	0.15	2.70	0.00	15.58
Mean			**0.11**	**2.67**	**0.00**	**16.90**

DON = Dissolved organic nitrogen
MBN = Microbial biomass nitrogen
Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 7.
Results of Carbon Analysis
Naples Truck Stop Site
Naples, UT
April 1999

Location	Replicate	Incubation Time (d)	DOC (ug/g soil)	MBC (ug/g soil)	Location	Replicate	CO_2-C production (ug/g soil)							
							Day 7	Day 14	Day 21	Day 28	Day 35	Day 42	Total CO_2-C	Mean total CO_2-C
1	1	0	83.01	32.76	1	1	9.55	5.55	5.48	1.25	5.55	1.82	29.20	
1	1	42	154.30	283.21	1	2	6.72	9.32	3.45	3.35	12.50	2.21	37.53	33.37
2	1	0	149.96	53.50	2	1	6.03	9.61	3.41	3.66	5.96	1.74	30.41	
2	1	42	145.59	214.33	2	2	5.49	7.73	3.86	2.10	19.83	1.73	40.74	35.58
3	1	0	95.02	20.38	3	1	7.57	11.01	4.72	4.70	2.73	1.95	32.68	
3	1	42	123.40	216.73	3	2	5.91	37.47	NA	2.70	17.78	0.84	64.70	48.69
4	1	0	113.30	6.69	4	1	10.96	6.72	2.32	1.43	6.67	2.58	30.69	
4	1	42	198.07	232.43	4	2	2.77	50.14	2.32	1.53	23.50	4.39	84.64	57.67
5	1	0	93.24	18.29	5	1	4.37	39.46	3.18	0.77	16.95	6.39	71.12	
5	1	42	216.53	416.93	5	2	7.57	47.34	4.17	2.11	15.38	1.91	78.46	74.79
6	1	0	170.25	361.24	6	1	43.64	123.4	36.86	32.44	94.78	60.43	391.54	
6	1	42	153.50	687.76	6	2	43.33	45.99	25.79	17.84	125.82	53.31	312.08	351.81
7	1	0	79.35	268.25	7	1	7.38	35.44	5.09	3.75	40.19	7.69	99.53	
7	1	42	90.15	821.58	7	2	3.23	33.62	4.26	3.06	63.10	2.85	110.12	104.83

DOC = Dissolved organic carbon
MBC = Microbial biomass carbon
Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 8.
Results of Enzyme Analysis
Naples Truck Stop Site
Naples, UT
April 1999

Location	Replicate	Incubation Time	Dehydrogenase Activity (ug TTF/g soil)	*B*-glucosidase Activity (ug PNP/g soil)
1	1	0	0.94	3.06
1	1	42	1.67	13.66
2	1	0	3.95	4.11
2	1	42	5.90	5.93
3	1	0	2.92	0.33
3	1	42	6.41	4.44
4	1	0	2.36	0.55
4	1	42	2.15	4.62
5	1	0	0.93	1.54
5	1	42	5.18	4.77
6	1	0	3.53	24.50
6	1	42	8.54	52.64
7	1	0	3.29	5.50
7	1	42	3.80	9.26

Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 9.
Results of Fungal Analysis
Naples Truck Stop Site
Naples, UT
April 1999

Location	Replicate	Incubation Time (d)	Soil wt. (g)	Soil dry wt. (g)	Active Fungal Length (cm/g soil)	Active Fungal Biomass (ug/g soil)
1	1	0	11.93	0.86	0.00	0.00
1	1	42	12.46	0.76	0.00	0.00
2	1	0	11.91	0.89	0.00	0.00
2	1	42	13.93	0.74	37.64	0.48
3	1	0	12.89	0.92	0.00	0.00
3	1	42	12.22	0.72	0.00	0.00
4	1	0	13.56	0.88	0.00	0.00
4	1	42	12.44	0.75	0.00	0.00
5	1	0	13.17	0.90	0.00	0.00
5	1	42	15.21	0.78	25.08	0.18
6	1	0	16.04	0.93	41.83	0.84
6	1	42	12.35	0.80	553.03	7.12
7	1	0	15.06	0.94	0.00	0.00
7	1	42	12.35	0.80	17.44	0.13

Note: Location 6 is reference location
Note: Location 7 is fill sample

TABLE 10.
Comparison of Mean Metal Concentrations Detected in Soil
Naples Truck Stop Site
Naples, UT
April 1999

Metal	USGS County	USGS Western US	Naples Truck Stop Site Samples
Aluminum	20,000	58,000	7,100
Antimony	NA	0.47	ND
Arsenic	6.3	5.5	5.3
Barium	300	580	210
Beryllium	N	0.68	0.45
Boron	30	23	11
Cadmium	NA	NA	0.08
Calcium	7,500	18,000	66,000
Chromium	50	41	8.9
Cobalt	5	7.1	3.7
Copper	20	21	8.8
Iron	10,000	21,000	8,200
Lead	N	17	8.0
Magnesium	3,000	7,400	6,800
Manganese	150	380	180
Mercury	0.06	0.046	ND
Molybdenum	N	0.85	0.76
Nickel	10	15	8.0
Potassium	17,000	18,000	1,600
Selenium	0.1	0.23	ND
Silver	NA	NA	ND
Sodium	7,000	9,700	240
Thallium	NA	NA	ND
Vanadium	30	70	21
Zinc	30	55	26

NA denotes the elements were not included in the list
ND denotes compound not detected
Note: All samples recorded in parts per million

TABLE 11.
Comparison of Mean and Standard Deviation for Metal Concentrations
Detected in REAC and U.S.G.S. Western U.S. Samples
Naples Truck Stop Site
Naples, UT
April 1999

Metal	U.S.G.S. Western U.S.		REAC Samples	
	Mean	Standard Deviation	Mean	Standard Deviation
Aluminum	58,000	20,000	7,100	1,400
Antimony	0.47	2.2	ND	ND
Arsenic	5.5	2.0	5.3	0.2
Barium	580	1.7	210	36
Beryllium	0.68	2.3	0.45	0.06
Boron	23	2.0	11	2.9
Cadmium	NA	NA	0.08	0.17
Calcium	18,000	31,000	66,000	19,000
Chromium	41	2.2	8.9	1.2
Cobalt	7.1	2.0	3.7	0.58
Copper	21	2.1	8.8	1.2
Iron	21,000	20,000	8,200	880
Lead	17	1.8	8.0	3.1
Magnesium	7,400	22,000	6,800	1,200
Manganese	380	2.0	180	29
Mercury	0.046	2.3	ND	ND
Molybdenum	0.85	2.2	0.76	0.14
Nickel	15	2.1	8.0	1.2
Potassium	18,000	7100	1,600	370
Selenium	0.23	2.4	ND	ND
Silver	NA	NA	ND	ND
Sodium	9,700	20,000	240	75
Thallium	NA	NA	ND	ND
Vanadium	70	2.0	21	0.81
Zinc	55	1.8	26	3.4

ND denotes not detected
NA denotes compounds not found in list
Note: All samples recorded in parts per million

TABLE 12.
Natural Resources Conservation Service Results for Soil Samples
Naples Truck Stop Site
Naples, Utah
April 1999

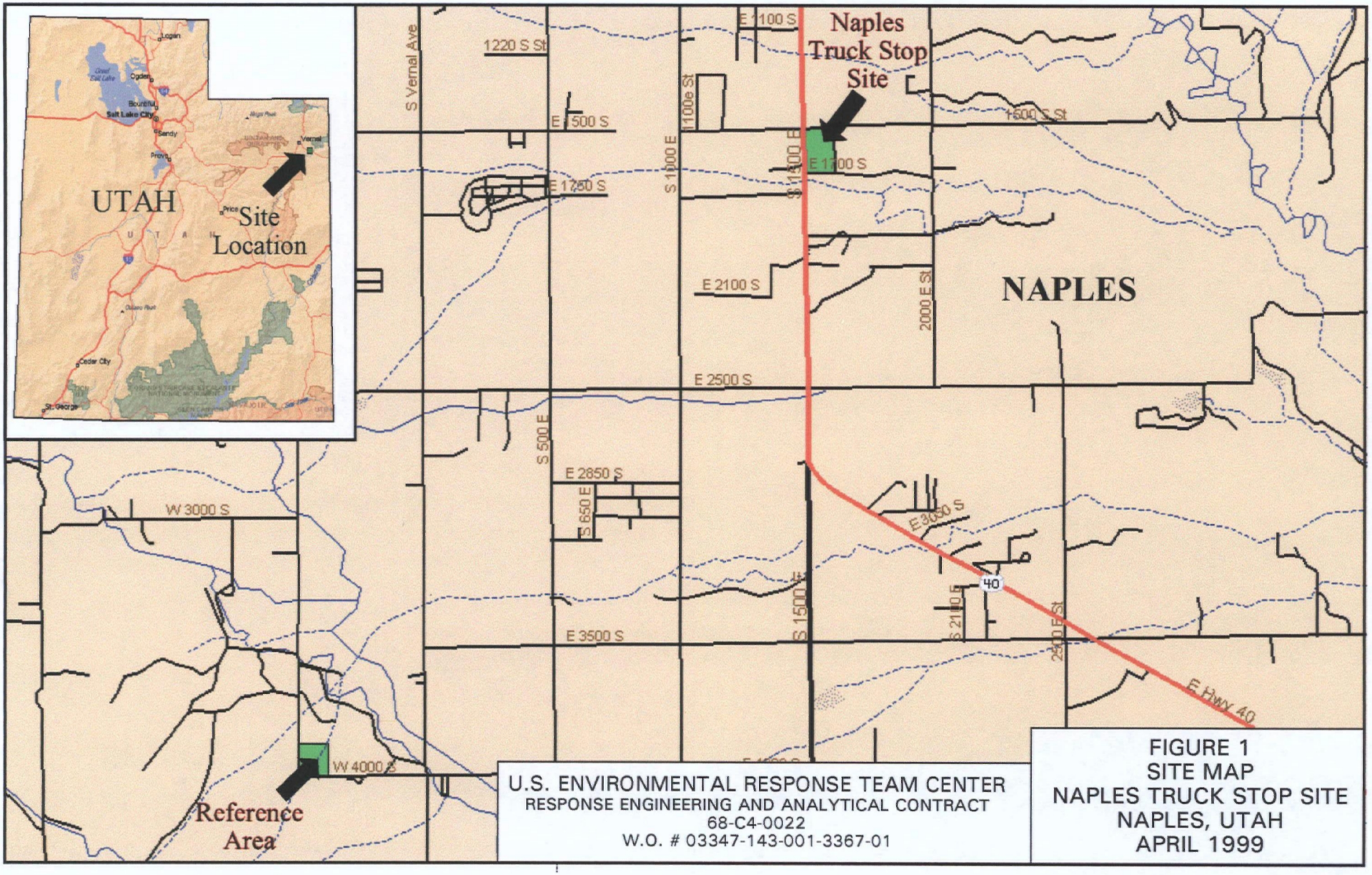
Map Symbol	Soil Series Name	Equivalent REAC Sampling Area	Depth of Sample (Inches)	Cation Exchange Capacity (meq/100g)	Soil pH	Salinity (mmhos/cm)
162	Nolava	Naples Truck Stop	34 - 60	7.0 - 12.0	7.9 - 9.0	0 - 4
162	Nolava	Naples Truck Stop	46 - 65	8.0 - 12.0	7.9 - 9.0	0 - 4
163	Nolava	Reference Area	46 - 65	8.0 - 12.0	7.9 - 9.0	0 - 4
163	Nolava	Reference Area	46 - 65	8.0 - 12.0	7.9 - 9.0	0 - 4

Note: Multiple samples collected by the NRCS, 1999.

TABLE 13.
Comparison of Elements Sufficient for Plant Growth with Soil Samples Collected at
Naples Truck Stop Site
Naples, Utah
April 1999

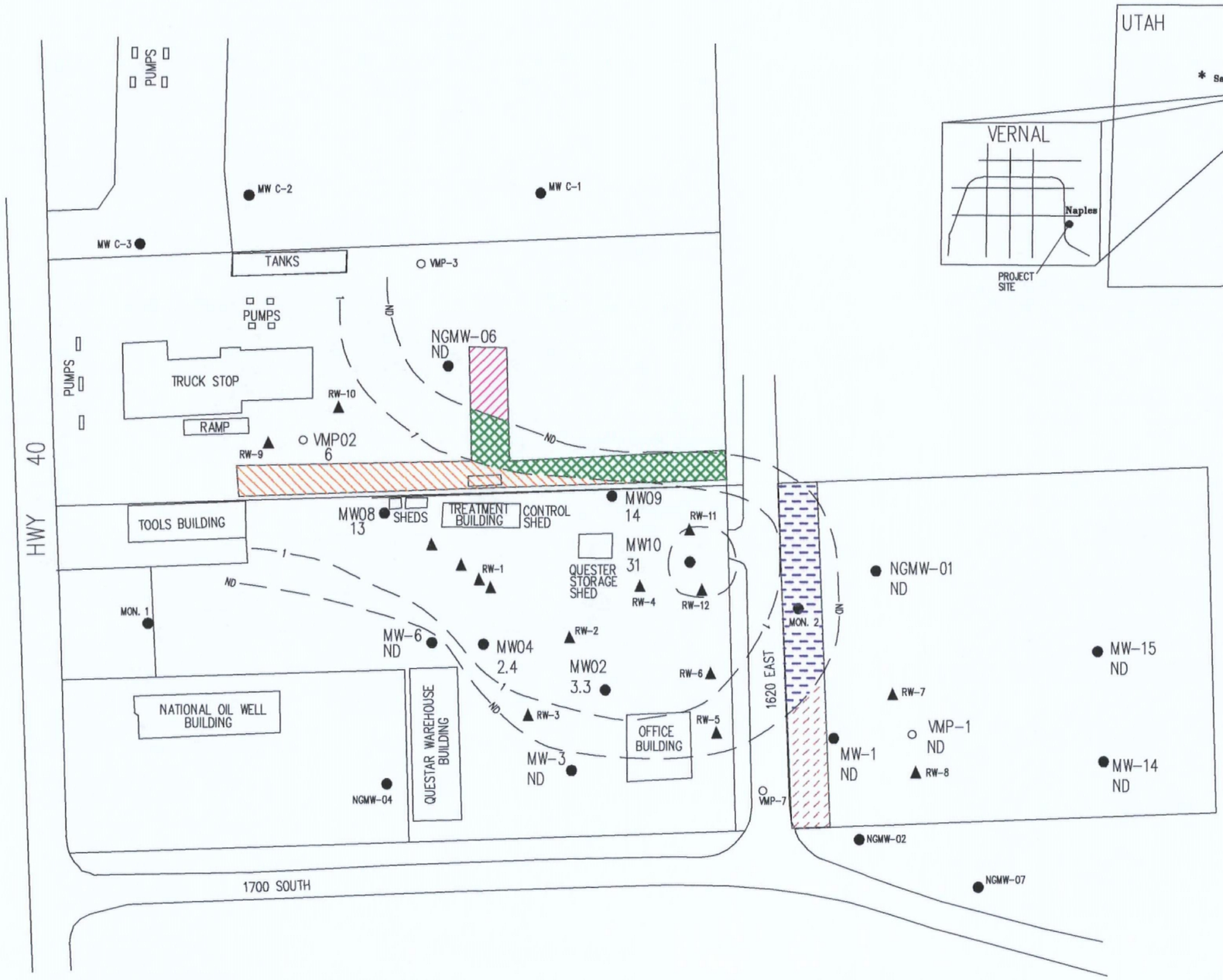
Element	Epstein Concentration (mg/kg)	Naples Truck Stop Concentration (mg/kg)
Potassium	10,000	108
Calcium	5,000	14,000
Magnesium	2,000	910
Phosphorus	2,000	21
Boron	20	1.5
Manganese	50	21
Zinc	20	1.4
Copper	6	0.58
Molybdenum	0.1	0.76

Note: Naples Truck Stop concentrations are means (n=7)
mg/kg denotes milligrams/kilogram
Source: Epstein, 1965.



U.S. ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022
W.O. # 03347-143-001-3367-01

FIGURE 1
SITE MAP
NAPLES TRUCK STOP SITE
NAPLES, UTAH
APRIL 1999



SAMPLING AREA 1
SAMPLING AREA 2
SAMPLING AREA 3
SAMPLING AREA 4
SAMPLING AREA 5

MW10 31 MONITORING WELL WITH GASOLINE CONCENTRATION POSTED IN MG/L

VMP-1 VAPOR MONITORING POINTS MONITORING WELL

RW-6 RECOVERY WELL

ISOCONCENTRATION CONTOUR OF GASOLINE IN MG/L (COUNTOURS DASHED WHERE INFERRED).

GRAPHIC SCALE

100 0 50 100 200

1 inch = 100 ft.

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
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FIGURE 2

SITE PLAN WITH GASOLINE PLUME CONTOURS
AND TREE PLANTING AREAS
MARCH 1998 MONITORING WELL DATA
NAPLES TRUCK STOP
NAPLES, UTAH
APRIL 1999

1/26/99

367/FIG1.DWG

HOW SOIL pH AFFECTS AVAILABILITY OF PLANT NUTRIENTS

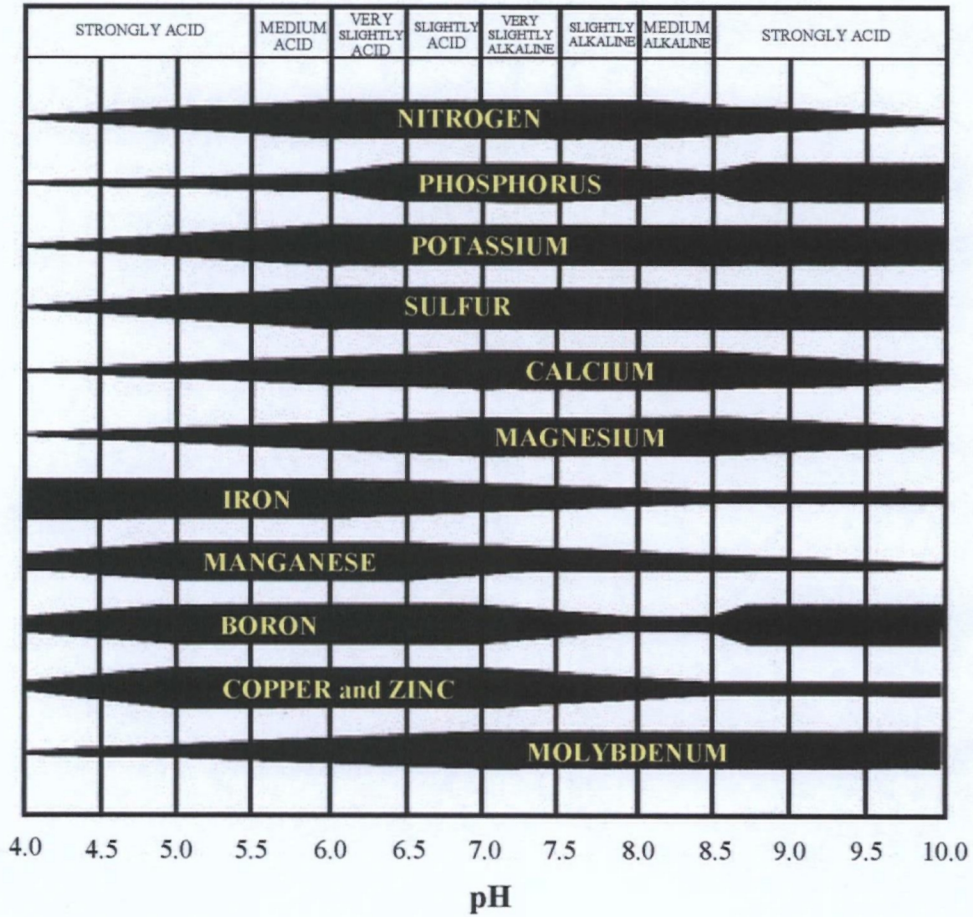

FIGURE 3
NUTRIENT AVAILABILITY TO PLANTS RELATIVE TO pH
NAPLES TRUCK STOP SITE
NAPLES, UTAH
APRIL 1999

U.S. ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022
W.O. # 03347-143-001-3367-01

Obtained from:
http://bioag.byu.edu/aghort/282pres/pH/sld003.htm

APPENDIX A
Final Analytical Results
Naples Truck Stop Site
Final Report
April 1999

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DATE: 23 December 1998

TO: R. Singhvi EPA/ERTC

FROM: V. Kansal Analytical Section Leader Vinod Kansal

SUBJECT: DOCUMENT TRANSMITTAL UNDER WORK ASSIGNMENT # 3-367

Attached please find the following document prepared under this work assignment:

Naples Truck Stop - Analytical Report

Central File WA # 3-367 (w/attachment)
H. Compton Work Assignment Managers (w/attachment)
J. Royce Task Leader (w/attachment)
M. Barkley Data Validation and Report Writing Group Leader (w/o attachment)

3367\DEL.AR.9812\NAPLESAR

ANALYTICAL REPORT

Prepared by
Roy F. Weston, Inc.

Naples Truck Stop
Naples, UT

December, 1998

EPA Work Assignment No. 3-367
WESTON Work Order No. 03347-143-001-3367-01
EPA Contract No. 68-C4-0022

Submitted to
H. Compton
EPA-ERTC

for J. Royce — 12/23/98 Date
Task Leader

V. Kansal — 12/23/98 Date
Analytical Section Leader

E. Gilardi — 12/28/98 Date
Program Manager

Analysis by:
REAC, Galson, Kemron

Prepared by:
D. Laviska

Reviewed by:
M. Barkley

3367\DEL\AR\9812\NAPLESAR

Table of Contents

Table of Contents (cont.)

Appendices will be furnished on request.

Introduction

REAC, in response to WA #3-367, provided analytical support for environmental samples collected from the Naples Truck Stop located in Naples, UT as described in the following table. The support also included QA/QC, data review, and preparation of an analytical report containing a summary of the analytical methods, the results, and the QA/QC results.

The samples were treated with procedures consistent with those described in SOP #1008.

Chain of Custody	Number of Samples Analyzed	Sampling Date	Date Received	Matrix	Analysis	Laboratory
3367-0004	8	11/02/98	11/04/98	Soil	Pesticide/PCB	REAC
3367-0005	8				TAL Metals, Mo, B	Galson
3367-0006	9				VOC	REAC
3367-0007	7				TPH, Semivolatiles	Kemron
	8				Herbicides	

CASE NARRATIVE

Data Package H507 - VOC Analysis

In the initial calibration of 10/28/98, the percent relative standard deviation (%RSD) for naphthalene (44%) exceeded the acceptable QC limits. This compound was not detected in the associated samples; the data are not affected.

In the continuing calibration of 11/04/98 (am), the percent difference (%D) for acetone (27%) exceeded the acceptable QC limits. This compound was not detected in the associated samples; the data are not affected.

In the continuing calibration of 11/04/98 (pm), the percent difference (%D) for naphthalene (30%) exceeded the acceptable QC limits. This compound was not detected in the associated samples; the data are not affected.

Data Package H497 - Pesticide/PCB Analysis

Peak heights were used instead of compound concentrations to calculate the percent breakdown for the performance evaluation mixture (PEM) of 10/20/98. This PEM was within the acceptable QC criteria using peak heights.

In the continuing calibration of 11/06/98, the percent difference (%D) for endosulfan sulfate (27%) exceeded the acceptable QC limits. This compound was not detected in the associated samples; the data are not affected.

Data Package H537 - Metals Analysis

Lead (0.273 mg/kg) and zinc (1.855 mg/kg) were detected in the method blank. The results for these metals in the associated samples 3367-001, 3367-002, 3367-003, 3367-004, 3367-005, 3367-006, and 3367-007 are greater than five times the respective concentrations found in the method blank; these data are not affected. The results for these metals in the sample 3367-008 (Field Blank) are less than five times the respective concentrations found in the method blank and should be considered nondetected.

Aluminum (24.3 mg/kg), barium (0.37 mg/kg), calcium (37.1 mg/kg), chromium (0.27 mg/kg), copper (2.0 mg/kg), iron (94.4 mg/kg), lead (0.63 mg/kg), magnesium (10.6 mg/kg), manganese (2.3 mg/kg), and zinc (2.7 mg/kg) were detected in the field blank (sample 3367-008).

The recoveries of the matrix spike (26%) for antimony and the matrix spike (131%) for arsenic in the sample 3367-002 were outside the acceptable QC limits. The results for antimony in the associated samples 3367-001, 3367-002, 3367-003, 3367-004, 3367-005, 3367-006, 3367-007, and 3367-008 should be considered unusable. The results for arsenic in the same associated samples (excepting 3367-008) should be considered estimated. The result for arsenic in the sample 3367-008 is not affected.

Data Package H508 - Herbicides, Semivolatiles, and TPH Analyses

The temperature of the sample cooler was 7 °C when it was received by the subcontracted laboratory.

The field blank sample (3367-008) was not analyzed for the semivolatile compounds (4-nitrophenol and pentachlorophenol), nor for the library search compounds (bentazon, chloramben, and 5-hydroxydicamba). None of these compounds was detected in the associated samples; the data are not affected.

In the analysis for herbicides, the matrix spike (3%) and matrix spike duplicate (4%) recoveries for dinoseb in the sample 3367-002 were outside the acceptable QC limits. Additionally, the LCS recovery (0%) for dinoseb was outside the acceptable QC limits. The results for dinoseb in all the associated samples (3367-001, 3367-002, 3367-003, 3367-004, 3367-005, 3367-006, 3367-007, and 3367-008) should be considered unusable.

In the analysis for semivolatiles, the recoveries of two base-neutral and one acid surrogates were outside the acceptable QC limits. The target compounds for this analysis are from the acid fraction; the data are not affected.

In the analysis for semivolatiles, the internal standard areas for acenaphthene-d10 and perylene-d12 were outside the acceptable QC limits for the sample 3367-007. The result for 4-nitrophenol in this sample should be considered estimated.

Summary of Abbreviations

AA	Atomic Absorption
B	The analyte was found in the blank
BFB	Bromofluorobenzene
C	Centigrade
D	(Surrogate Table) this value is from a diluted sample and was not calculated (Result Table) this result was obtained from a diluted sample
Dioxin	denotes Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans and/or PCDD and PCDF
CLP	Contract Laboratory Protocol
COC	Chain of Custody
CONC	Concentration
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
DFTPP	Decafluorotriphenylphosphine
DL	Detection Limit
E	The value is greater than the highest linear standard and is estimated
EMPC	Estimated maximum possible concentration
ICAP	Inductively Coupled Argon Plasma
ISTD	Internal Standard
J	The value is below the method detection limit and is estimated
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MDL	Method Detection Limit
MI	Matrix Interference
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MW	Molecular Weight
NA	either Not Applicable or Not Available
NC	Not Calculated
NR	Not Requested
NS	Not Spiked
% D	Percent Difference
% REC	Percent Recovery
PQL	Practical Quantitation Limit
PPBV	Parts per billion by volume
QL	Quantitation Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SIM	Selected Ion Mode
TCLP	Toxic Characteristics Leaching Procedure
U	Denotes not detected
W	Weathered analyte; the results should be regarded as estimated

m^3	cubic meter	kg	kilogram	μg	microgram
L	liter	g	gram	pg	picogram
mL	milliliter	mg	milligram		
μL	microliter				

*	denotes a value that exceeds the acceptable QC limit
	Abbreviations that are specific to a particular table are explained in footnotes on that table
	Revision 07/09/98

Analytical Procedure for VOC in Soil

Analytical Procedure

A modified 524.2 method for the analysis of Volatile Organic Compounds in soil was used. Samples were purged, trapped, and desorbed to a GC/MS system. Prior to purging, the samples were spiked with a three component surrogate mixture consisting of toluene-d_8, 4-bromofluorobenzene and 1,2-dichloroethane-d_4, and a three component internal standard mixture consisting of bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d_5.

The purge and trap unit consisted of: A Tekmar concentrator (3000 Series) equipped with an autosampler (Dynatech) and a trap consisting of a VOCARB 4000 (Supelco), which itself contained of four adsorbent beds: Carbopack B (graphitized carbon 60/80 mesh), Carbopack C (graphitized carbon 60/80 mesh), Carboxen-1000 (60/80 mesh), and Carboxen-1001 (60/80 mesh).

The purge and trap instrument conditions were:

Purge	10 min at 25 °C
Dry Purge	2 min at 25 °C
Desorb Preheat	230 °C
Desorb	4 min at 230 °C
Purge Flow Rate	40 mL/min
Bake	8 min at 250 °C

A Hewlett Packard 5970 GC/MSD equipped with an RTE-A data system was used to analyze the data.

The instrument conditions were:

Column:	30 meter x 0.53mm ID, RTx-Volatiles (Restek Corp.) column with 3.0µm thickness.
Temperature:	5 min at 10 °C 6 °C/min to 140 °C 0.1 min at 140 °C 12 °C/min to 160 °C 5 min at 160 °C
Flow Rate	Helium at 10 mL/min
GC/MS Interface	Glass jet separator with 30 mL/min helium make-up gas at 250 °C.
Mass Spectrometer:	Electron Impact Ionization at a nominal electron energy of 70 electron volts, scanning from 35-300 amu at one scan/sec.
Computer:	Preprogrammed to plot Extracted Ion Current Profile (EICP): Capable of integrating ions and plotting abundances vs time or scan number. A library search (NBS-Wiley) for tentatively identified compounds was performed on samples.

The GC/MS system was calibrated using 6 VOC standards at 5, 20, 50, 100, 150, and 200 µg/L. Before analysis each day, the system was tuned with 50 ng BFB and passed a continuing calibration check when analyzing a 50 µg/L standard mixture in which the responses were evaluated by comparison to the average response of the calibration curve.

The results are listed in Table 1.1 and the Tentatively Identified Compounds are listed in Table 1.2. The concentrations of the analytes were calculated using the following equation:

$$C_u = \frac{DF \times A_x \times I_{is}}{A_{is} \times RF \text{ (or } RF_{ave}) \times W_s \times D}$$

where

C_u	= concentration of the target analyte (µg/L)
DF	= Dilution Factor
A_x	= Area of the target analyte
I_{is}	= ng of specific internal standard
A_{is}	= Area of the specific internal standard
RF	= Response Factor
RF_{ave}	= average Response Factor
W_s	= Weight of sample (g)
D	= Decimal percent solids

The average Response Factor is used when a sample is associated with an initial calibration curve. The Response Factor is used when a sample is associated with a continuing calibration curve.

Response Factor calculation:

The response factor (RF) for each specific analyte is quantitated based on the area response from the continuing calibration check as follows:

$$RF = \frac{A_c \times I_{is}}{A_{is} \times I_c}$$

where,

RF	= Response factor for a specific analyte
A_c	= Area of the analyte in the standard
I_{is}	= Mass of the specific internal standard
A_{is}	= Area of the specific internal standard
I_c	= Mass of the analyte in the standard

$$RF_{ave} = \frac{RF_1 + \ldots + RF_n}{n}$$

where

n = number of Samples

Revision of 6/28/94

Analytical Procedure for Pesticide/PCB in Soil

Extraction Procedure

Thirty grams of sample were mixed with thirty grams of sodium sulfate and were spiked with a surrogate solution consisting of tetrachloro-m-xylene and decachlorobiphenyl. The prepared sample was then extracted three times with 60 mL portions of hexane. The combined extracts were filtered and concentrated to 5.0 mL.

Gas Chromatographic Analysis

The samples were analyzed for pesticides and PCBs (screening) using simultaneous dual column injections. The analysis was done on an HP 6890 GC/ECD system, equipped with an HP 6890 automatic injector, and controlled with an HP-ChemStation. The following conditions were employed:

First Column	DB-608, 30 meter, 0.32mm fused silica capillary, 0.50 µm film thickness
Injector Temperature	200 °C
Detector Temperature	325 °C
Temperature Program	120 °C for 1 minute 9 °C/min to 285 °C, 10 min at 285 °C
Injection Volume	1µL
Second Column	Rtx-CLPesticides, 30 meter, 0.32mm fused silica capillary, 0.50 µm film thickness
Injector Temperature	200 °C
Detector Temperature	325 °C
Temperature Program	120 °C for 1 minute 9 °C/min to 285 °C, 10 min at 285 °C
Injection Volume	1µL

The gas chromatographs were calibrated using 5 pesticide standards at 20, 50, 100, 200, and 500 µg/L. The results from each mixture were used to calculate the response factor (RF) of each analyte and the average Response Factor was used to calculate the concentration of pesticide in the sample. Quantification was based on the DB-608 column (signal 1) and the identity of the analyte was confirmed using the Rtx-CLPesticides column (signal 2). A fingerprint chromatogram was run using each of the seven Aroclor mixtures and toxaphene; calibration curves were run only if a particular Aroclor or toxaphene was found in the sample.

The pesticide/PCB results for soil, listed in Table 1.3, are calculated by using the following formula:

$$C_u = \frac{DF x A_u x V_t}{RF_{ave} x V_i x W x D}$$

where

C_u = Concentration of analyte (μg/kg)
DF = Dilution Factor
A_u = Area or peak height
V_t = Volume of sample (mL)
RF_{ave} = Average response factor
V_i = Volume of extract injected (μL)
W = Weight of sample (g)
D = Decimal percent solids

Response Factor calculation:

The RF for each specific analyte is quantitated based on the area response from the continuing calibration check as follows:

$$RF = \frac{A_u}{total\ pg\ injected}$$

where

A_u = Area or peak height

and

$$RF_{ave} = \frac{RF_1 + \ldots + RF_n}{n}$$

where

n = number of samples

Revision 7/22/97

Analytical Procedure for Metals in Soil

The subcontracted laboratory determined the concentrations of metals in soil samples by following the SW-846 methods 6010 and 7000. The results of the analyses are listed in Table 1.4.

Analytical Procedure for Herbicides in Soil

The subcontracted laboratory determined the concentrations of herbicides in soil samples by following the method 8151A. The results of the analysis are listed in Table 1.5.

Analytical Procedure for Semivolatiles in Soil

The subcontracted laboratory determined the concentrations of semivolatiles in soil samples by following the method 8270C\3550B. The results of the analysis are listed in Table 1.5.

Analytical Procedure for TPH in Soil

The subcontracted laboratory determined the concentration of TPH in soil samples by following the modified EPA method 418.1. The results of the analysis are listed in Table 1.5.

Table 1.1 Results of the Analysis for VOC in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

SAMPLE # :	Sand Blank		3367-001		3367-004	
LOCATION :			Location 1		location 4	
COLLECTED :			11/02/98		11/02/98	
ANALYZED :	11/04/98		11/04/98		11/04/98	
INJECTED :	11:13 AM		12:00		14:22	
FILE # :	A5195		A5196		A5199	
DIL. FACT.:	1		1		1	
% Solid :	100		86		87	
UNIT :	µg/kg		µg/kg		µg/kg	
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	1.2	U	1.1
Chloromethane	U	1.0	U	1.2	U	1.1
Vinyl Chloride	U	1.0	U	1.2	U	1.1
Bromomethane	U	2.0	U	2.3	U	2.3
Chloroethane	U	1.0	U	1.2	U	1.1
Trichlorofluoromethane	U	1.0	U	1.2	U	1.1
Acetone	U	2.0	U	2.3	430	2.3
1,1-Dichloroethene	U	1.0	U	1.2	U	1.1
Carbon Disulfide	U	1.0	U	1.2	U	1.1
Methylene Chloride	U	1.0	U	1.2	U	1.1
Methyl-tertiary-butylether	U	1.0	U	1.2	U	1.1
trans-1,2-Dichloroethene	U	1.0	U	1.2	U	1.1
1,1-Dichloroethane	U	1.0	U	1.2	U	1.1
2-Butanone	U	4.0	U	4.7	12	4.6
2,2-Dichloropropane	U	1.0	U	1.2	U	1.1
cis-1,2-Dichloroethene	U	1.0	U	1.2	U	1.1
Chloroform	U	1.0	U	1.2	U	1.1
1,1-Dichloropropene	U	1.0	U	1.2	U	1.1
1,2-Dichloroethane	U	1.0	U	1.2	U	1.1
1,1,1-Trichloroethane	U	1.0	U	1.2	U	1.1
Carbon Tetrachloride	U	1.0	U	1.2	U	1.1
Benzene	U	1.0	U	1.2	U	1.1
Trichloroethene	U	1.0	U	1.2	U	1.1
1,2-Dichloropropane	U	1.0	U	1.2	U	1.1
Dibromomethane	U	1.0	U	1.2	U	1.1
Bromodichloromethane	U	1.0	U	1.2	U	1.1
cis-1,3-Dichloropropene	U	1.0	U	1.2	U	1.1
trans-1,3-Dichloropropene	U	1.0	U	1.2	U	1.1
1,1,2-Trichloroethane	U	1.0	U	1.2	U	1.1
1,3-Dichloropropane	U	1.0	U	1.2	U	1.1
Dibromochloromethane	U	1.0	U	1.2	U	1.1
1,2-Dibromoethane	U	1.0	U	1.2	U	1.1
Bromoform	U	1.0	U	1.2	U	1.1
4-Methyl-2-Pentanone	U	2.0	U	2.3	U	2.3

Table 1.1 (cont.) Results of the Analysis for VOC in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

SAMPLE # :	Sand Blank		3367-001		3367-004					
LOCATION :			Location 1		location 4					
COLLECTED :			11/02/98		11/02/98					
ANALYZED :	11/04/98		11/04/98		11/04/98					
INJECTED :	11:13 AM		12:00		14:22					
FILE # :	A5195		A5196		A5199					
DIL. FACT.:	1		1		1					
% Solid :	100		86		87					
UNIT :	µg/kg		µg/kg		µg/kg					
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.2	U	1.1				
2-Hexanone	U	2.0	U	2.3	U	2.3				
Tetrachloroethene	U	1.0	U	1.2	U	1.1				
Chlorobenzene	U	1.0	U	1.2	U	1.1				
1,1,1,2-Tetrachloroethane	U	1.0	U	1.2	U	1.1				
Ethylbenzene	U	1.0	U	1.2	U	1.1				
p & m-Xylene	U	1.0	U	1.2	U	1.1				
o-Xylene	U	1.0	U	1.2	U	1.1				
Styrene	U	1.0	U	1.2	U	1.1				
Isopropylbenzene	U	1.0	U	1.2	U	1.1				
1,1,2,2-Tetrachloroethane	U	1.0	U	1.2	U	1.1				
1,2,3-Trichloropropane	U	1.0	U	1.2	U	1.1				
Bromobenzene	U	1.0	U	1.2	U	1.1				
n-Propylbenzene	U	1.0	U	1.2	U	1.1				
2-Chlorotoluene	U	1.0	U	1.2	U	1.1				
4-Chlorotoluene	U	1.0	U	1.2	U	1.1				
1,3,5-Trimethylbenzene	U	1.0	U	1.2	U	1.1				
tert-Butylbenzene	U	1.0	U	1.2	U	1.1				
1,2,4-Trimethylbenzene	U	1.0	U	1.2	U	1.1				
sec-Butylbenzene	U	1.0	U	1.2	U	1.1				
1,3-Dichlorobenzene	U	1.0	U	1.2	U	1.1				
p-Isopropyltoluene	U	1.0	U	1.2	U	1.1				
1,4-Dichlorobenzene	U	1.0	U	1.2	U	1.1				
1,2-Dichlorobenzene	U	1.0	U	1.2	U	1.1				
n-Butylbenzene	U	1.0	U	1.2	U	1.1				
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.2	U	1.1				
1,2,4-Trichlorobenzene	U	1.0	U	1.2	U	1.1				
Naphthalene	U	1.0	U	1.2	U	1.1				
Hexachlorobutadiene	U	1.0	U	1.2	U	1.1				
1,2,3-Trichlorobenzene	U	1.0	U	1.2	U	1.1				

Table 1.1 (cont.) Results of the Analysis for VOC in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

SAMPLE # :	Sand Blank		3367-009		3367-008		3367-007		3367-006	
LOCATION :			Trip Blank		Field Blank		Fill		Location 6	
COLLECTED :			11/02/98		11/02/98		11/02/98		11/02/98	
ANALYZED :	11/04/98		11/04/98		11/04/98		11/04/98		11/04/98	
INJECTED :	17:10		17:57		18:44		19:31		20:17	
FILE # :	A5202		A5203		A5204		A5205		A5206	
DIL. FACT.:	1		1		1		1		1	
% Solid :	100		100		100		95		92	
UNIT :	µg/kg		µg/kg		µg/kg		µg/kg		µg/kg	
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Chloromethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Vinyl Chloride	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Bromomethane	U	2.0	U	2.0	U	2.0	U	2.1	U	2.2
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Acetone	U	2.0	U	2.0	U	2.0	U	2.1	U	2.2
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Methyl-tertiary-butylether	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
trans-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
2-Butanone	U	4.0	U	4.0	U	4.0	U	4.2	U	4.3
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
cis-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Chloroform	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Benzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Trichloroethene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Dibromomethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Bromoform	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	2.1	U	2.2

Table 1.1 (cont.) Results of the Analysis for VOC in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

SAMPLE # :	Sand Blank		3367-009		3367-008		3367-007		3367-006	
LOCATION :			Trip Blank		Field Blank		Fill		Location 6	
COLLECTED :			11/02/98		11/02/98		11/02/98		11/02/98	
ANALYZED :	11/04/98		11/04/98		11/04/98		11/04/98		11/04/98	
INJECTED :	17:10		17:57		18:44		19:31		20:17	
FILE # :	A5202		A5203		A5204		A5205		A5206	
DIL. FACT.:	1		1		1		1		1	
% Solid :	100		100		100		95		92	
UNIT :	µg/kg		µg/kg		µg/kg		µg/kg		µg/kg	
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.1	U	2.2
Tetrachloroethene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
p & m-Xylene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Styrene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Isopropylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.1	U	1.1

Table 1.1 (cont.) Results of the Analysis for VOC in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

SAMPLE # :	Sand Blank		3367-005		3367-003		3367-002	
LOCATION :			Location 5		Location 3		Location 2	
COLLECTED :			11/02/98		11/02/98		11/02/98	
ANALYZED :	11/04/98		11/04/98		11/04/98		11/04/98	
INJECTED :	17:10		21:04		21:51		22:37	
FILE # :	A5202		A5207		A5208		A5209	
DIL. FACT.:	1		1		1		1	
% Solid :	100		89		92		88	
UNIT :	µg/kg		µg/kg		µg/kg		µg/kg	
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	U	1.0	U	1.1	U	1.1	U	1.1
Chloromethane	U	1.0	U	1.1	U	1.1	U	1.1
Vinyl Chloride	U	1.0	U	1.1	U	1.1	U	1.1
Bromomethane	U	2.0	U	2.2	U	2.2	U	2.3
Chloroethane	U	1.0	U	1.1	U	1.1	U	1.1
Trichlorofluoromethane	U	1.0	U	1.1	U	1.1	U	1.1
Acetone	U	2.0	61	2.2	46	2.2	46	2.3
1,1-Dichloroethene	U	1.0	U	1.1	U	1.1	U	1.1
Carbon Disulfide	U	1.0	U	1.1	U	1.1	U	1.1
Methylene Chloride	U	1.0	U	1.1	U	1.1	U	1.1
Methyl-tertiary-butylether	U	1.0	U	1.1	U	1.1	U	1.1
trans-1,2-Dichloroethene	U	1.0	U	1.1	U	1.1	U	1.1
1,1-Dichloroethane	U	1.0	U	1.1	U	1.1	U	1.1
2-Butanone	U	4.0	U	4.5	U	4.3	U	4.5
2,2-Dichloropropane	U	1.0	U	1.1	U	1.1	U	1.1
cis-1,2-Dichloroethene	U	1.0	U	1.1	U	1.1	U	1.1
Chloroform	U	1.0	U	1.1	U	1.1	U	1.1
1,1-Dichloropropene	U	1.0	U	1.1	U	1.1	U	1.1
1,2-Dichloroethane	U	1.0	U	1.1	U	1.1	U	1.1
1,1,1-Trichloroethane	U	1.0	U	1.1	U	1.1	U	1.1
Carbon Tetrachloride	U	1.0	U	1.1	U	1.1	U	1.1
Benzene	U	1.0	U	1.1	U	1.1	U	1.1
Trichloroethene	U	1.0	U	1.1	U	1.1	U	1.1
1,2-Dichloropropane	U	1.0	U	1.1	U	1.1	U	1.1
Dibromomethane	U	1.0	U	1.1	U	1.1	U	1.1
Bromodichloromethane	U	1.0	U	1.1	U	1.1	U	1.1
cis-1,3-Dichloropropene	U	1.0	U	1.1	U	1.1	U	1.1
trans-1,3-Dichloropropene	U	1.0	U	1.1	U	1.1	U	1.1
1,1,2-Trichloroethane	U	1.0	U	1.1	U	1.1	U	1.1
1,3-Dichloropropane	U	1.0	U	1.1	U	1.1	U	1.1
Dibromochloromethane	U	1.0	U	1.1	U	1.1	U	1.1
1,2-Dibromoethane	U	1.0	U	1.1	U	1.1	U	1.1
Bromoform	U	1.0	U	1.1	U	1.1	U	1.1
4-Methyl-2-Pentanone	U	2.0	U	2.2	U	2.2	U	2.3

Table 1.1 (cont.) Results of the Analysis for VOC in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

SAMPLE # :	Sand Blank		3367-005		3367-003		3367-002	
LOCATION :			Location 5		Location 3		Location 2	
COLLECTED :			11/02/98		11/02/98		11/02/98	
ANALYZED :	11/04/98		11/04/98		11/04/98		11/04/98	
INJECTED :	17:10		21:04		21:51		22:37	
FILE # :	A5202		A5207		A5208		A5209	
DIL. FACT.:	1		1		1		1	
% Solid :	100		89		92		88	
UNIT :	µg/kg		µg/kg		µg/kg		µg/kg	
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Toluene	U	1.0	U	1.1	U	1.1	U	1.1
2-Hexanone	U	2.0	U	2.2	U	2.2	U	2.3
Tetrachloroethene	U	1.0	U	1.1	U	1.1	U	1.1
Chlorobenzene	U	1.0	U	1.1	U	1.1	U	1.1
1,1,1,2-Tetrachloroethane	U	1.0	U	1.1	U	1.1	U	1.1
Ethylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
p & m-Xylene	U	1.0	U	1.1	U	1.1	U	1.1
o-Xylene	U	1.0	U	1.1	U	1.1	U	1.1
Styrene	U	1.0	U	1.1	U	1.1	U	1.1
Isopropylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
1,1,2,2-Tetrachloroethane	U	1.0	U	1.1	U	1.1	U	1.1
1,2,3-Trichloropropane	U	1.0	U	1.1	U	1.1	U	1.1
Bromobenzene	U	1.0	U	1.1	U	1.1	U	1.1
n-Propylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
2-Chlorotoluene	U	1.0	U	1.1	U	1.1	U	1.1
4-Chlorotoluene	U	1.0	U	1.1	U	1.1	U	1.1
1,3,5-Trimethylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
tert-Butylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
1,2,4-Trimethylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
sec-Butylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
1,3-Dichlorobenzene	U	1.0	U	1.1	U	1.1	U	1.1
p-Isopropyltoluene	U	1.0	U	1.1	U	1.1	U	1.1
1,4-Dichlorobenzene	U	1.0	U	1.1	U	1.1	U	1.1
1,2-Dichlorobenzene	U	1.0	U	1.1	U	1.1	U	1.1
n-Butylbenzene	U	1.0	U	1.1	U	1.1	U	1.1
1,2-Dibromo-3-Chloropropane	U	1.0	U	1.1	U	1.1	U	1.1
1,2,4-Trichlorobenzene	U	1.0	U	1.1	U	1.1	U	1.1
Naphthalene	U	1.0	U	1.1	U	1.1	U	1.1
Hexachlorobutadiene	U	1.0	U	1.1	U	1.1	U	1.1
1,2,3-Trichlorobenzene	U	1.0	U	1.1	U	1.1	U	1.1

Table 1.2 Results of TIC for VOC in Soil

WA# 3-367 Naples Truck Stop

Sample # SAND BLANK Unit µg/kg

LabFile# A5195 Con. Factor 1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # 3367-001 Unit µg/kg

LabFile# A5196 Con. Factor 1.1628

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # 3367-004 Unit µg/kg

LabFile# A5199 Con. Factor 1.1494

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # SAND BLANK Unit µg/kg

LabFile# A5202 Con. Factor 1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # 3367-009 Unit µg/kg

LabFile# A5203 Con. Factor 1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # 3367-008 Unit µg/kg

LabFile# A5204 Con. Factor 1

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil

WA# 3-367 Naples Truck Stop

Sample # 3367-007 Unit µg/kg

LabFile# A5205 Con. Factor 1.0526

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # 3367-006 Unit µg/kg

LabFile# A5206 Con. Factor 1.087

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # 3367-005 Unit µg/kg

LabFile# A5207 Con. Factor 1.1236

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA# 3-367 Naples Truck Stop

Sample # 3367-003 Unit µg/kg

LabFile# A5208 Con. Factor 1.087

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil

WA# 3-367 Naples Truck Stop

Sample # 3367-002 Unit µg/kg

LabFile# A5209 Con. Factor 1.1364

	CAS#	Compound	Q	RT	Conc
1		NO PEAKS FOUND			0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
17					0
18					0
19					0
20					0

*Estimated Concentration (Response Factor = 1.0)

Table 1.3 Results of the Analysis for Pesticide/PCB in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

Client ID	SBLK110498	3367-001	3367-002	3367-003	3367-004
Location	-	Location 1	Location 2	Location 3	Location 4
Percent Solid	100	85	88	92	87

Analyte	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg
a-BHC	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
g-BHC	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
b-BHC	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Heptachlor	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
d-BHC	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Aldrin	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Heptachlor Epoxide	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
g-Chlordane	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
a-Chlordane	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Endosulfan (I)	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
p,p'-D D E	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Dieldrin	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Endrin	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
p,p'-D D D	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Endosulfan (II)	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
p,p'-D D T	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Endrin Aldehyde	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Endosulfan Sulfate	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Methoxychlor	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Endrin Ketone	U	3.3	U	3.9	U	3.8	U	3.6	U	3.8
Toxaphene	U	83	U	98	U	95	U	90	U	95
Aroclor 1016	U	42	U	49	U	48	U	45	U	48
Aroclor 1221	U	83	U	98	U	95	U	90	U	95
Aroclor 1232	U	42	U	49	U	48	U	45	U	48
Aroclor 1242	U	42	U	49	U	48	U	45	U	48
Aroclor 1248	U	42	U	49	U	48	U	45	U	48
Aroclor 1254	U	42	U	49	U	48	U	45	U	48
Aroclor 1260	U	42	U	49	U	48	U	45	U	48

Table 1.3 (cont.) Results of the Analysis for Pesticide/PCB in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

Client ID	3367-005		3367-006		3367-007		3367-008	
Location	Location 5		Location 6		Fill		Field Blank	
Percent Solid	89		92		94		100	
Analyte	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg
a-BHC	U	3.7	U	3.6	U	3.6	U	3.3
g-BHC	U	3.7	U	3.6	U	3.6	U	3.3
b-BHC	U	3.7	U	3.6	U	3.6	U	3.3
Heptachlor	U	3.7	U	3.6	U	3.6	U	3.3
d-BHC	U	3.7	U	3.6	U	3.6	U	3.3
Aldrin	U	3.7	U	3.6	U	3.6	U	3.3
Heptachlor Epoxide	U	3.7	U	3.6	U	3.6	U	3.3
g-Chlordane	U	3.7	U	3.6	U	3.6	U	3.3
a-Chlordane	U	3.7	U	3.6	U	3.6	U	3.3
Endosulfan (I)	U	3.7	U	3.6	U	3.6	U	3.3
p,p'-D D E	U	3.7	U	3.6	U	3.6	U	3.3
Dieldrin	U	3.7	U	3.6	U	3.6	U	3.3
Endrin	U	3.7	U	3.6	U	3.6	U	3.3
p,p'-D D D	U	3.7	U	3.6	U	3.6	U	3.3
Endosulfan (II)	U	3.7	U	3.6	U	3.6	U	3.3
p,p'-D D T	U	3.7	U	3.6	U	3.6	U	3.3
Endrin Aldehyde	U	3.7	U	3.6	U	3.6	U	3.3
Endosulfan Sulfate	U	3.7	U	3.6	U	3.6	U	3.3
Methoxychlor	U	3.7	U	3.6	U	3.6	U	3.3
Endrin Ketone	U	3.7	U	3.6	U	3.6	U	3.3
Toxaphene	U	93	U	90	U	89	U	83
Aroclor 1016	U	47	U	45	U	44	U	42
Aroclor 1221	U	93	U	90	U	89	U	83
Aroclor 1232	U	47	U	45	U	44	U	42
Aroclor 1242	U	47	U	45	U	44	U	42
Aroclor 1248	U	47	U	45	U	44	U	42
Aroclor 1254	U	47	U	45	U	44	U	42
Aroclor 1260	U	47	U	45	U	44	U	42

Table 1.4 Results of the Analysis for Metals in Soil
WA # 3-367 Naples Truck Stop
Based on dry weight

Client ID	Method Blank		3367-001		3367-002		3367-003		3367-004		3367-005	
Location	Lab		Location 1		Location 2		Location 3		Location 4		Location 5	
%Solids	100		75		77		79		78		77	
Parameter	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg
Aluminum	U	4.4	5490		7700		5930		7590		8740	
Antimony	U	0.3	U	0.4	U	0.39	U	0.38	U	0.39	U	0.39
Arsenic	U	0.4	5.1		5.3		5.6		5.1		5.3	
Barium	U	0.1	230		150		208		243		218	
Beryllium	U	0.1	0.37		0.51		0.4		0.47		0.49	
Cadmium	U	0.3	U	0.4	U	0.39	U	0.38	0.39		U	0.39
Calcium	U	5.0	57400		42800		92100		74600		60700	
Chromium	U	0.1	8		9.8		7.5		9		10.2	
Cobalt	U	0.1	3.1		4.2		4.3		3.1		3.9	
Copper	U	0.2	7.7		10		9.7		7.3		9.5	
Iron	U	2.1	7370		9440		7450		7910		8650	
Lead	0.273	0.1	13		9.2		5.9		5.4		6.7	
Magnesium	U	1.0	5410		6390		7740		8360		6170	
Manganese	U	0.2	146		210		204		175		155	
Mercury	U	0.05	U	0.07	U	0.06	U	0.06	U	0.06	U	0.06
Nickel	U	0.2	6.7		9.5		8.7		6.9		8.2	
Potassium	U	13.7	1230		2130		1300		1430		1720	
Selenium	U	0.3	U	0.4	U	0.39	U	0.38	U	0.39	U	0.39
Silver	U	0.2	U	0.27	U	0.26	U	0.25	U	0.26	U	0.26
Sodium	U	76.9	285		211		354		193		172	
Thallium	U	0.6	U	0.8	U	0.78	U	0.76	U	0.77	U	0.79
Vanadium	U	0.1	20.2		20.3		19.9		21.3		21.8	
Zinc	1.855	0.2	26.7		30.3		22.5		22.9		28	
Boron	U	0.8	7.1		9.9		9.6		14.7		12	
Molybdenum	U	0.1	1		0.75		0.71		0.62		0.73	

Table 1.4 (cont.) Results of the Analysis for Metals in Soil
WA # 3-367 Naples Truck Stop
Based on dry weight

Client ID	3367-006		3367-007		3367-008	
Location	Location 6		Fill		Field Blank	
% Solids	81		82		86	
Parameter	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg
Aluminum	5230		4320		24.3	
Antimony	U	0.38	U	0.37	U	0.35
Arsenic	3.1		3.7		U	0.46
Barium	155		163		0.37	
Beryllium	0.4		0.31		U	0.12
Cadmium	0.43		U	0.37	U	0.35
Calcium	21500		24900		37.1	
Chromium	7.1		7		0.27	
Cobalt	3.2		3.5		U	0.12
Copper	9.1		8		2	
Iron	7110		7520		94.4	
Lead	7.3		6		0.63	
Magnesium	4230		4330		10.6	
Manganese	240		200		2.3	
Mercury	U	0.06	U	0.06	U	0.06
Nickel	7		6.9		U	0.23
Potassium	1720		999		U	15.9
Selenium	U	0.38	U	0.37	U	0.35
Silver	U	0.25	U	0.24	U	0.23
Sodium	107		289		U	89.2
Thallium	U	0.75	U	0.73	U	0.7
Vanadium	13.3		13.3		U	0.12
Zinc	30		24.7		2.7	
Boron	4.2		4.2		U	0.9
Molybdenum	0.51		0.45		U	0.1

Table 1.5 Results of the Analysis for Herbicides, Semivolatiles, and TPH in Soil
WA # 3-367 Naples Truck Stop
Based on dry weight

Client ID	Method Blank		3367-001		3367-002		3367-003		3367-004		3367-005	
Location	Lab		Location 1		Location 2		Location 3		Location 4		Location 5	
% Solids	—		87		89		92		88		89	
Parameter	Conc µg/kg	MDL µg/kg	Conc µg/kg	MDL µg/kg	Conc µg/kg	MDL µg/kg	Conc µg/kg	MDL µg/kg	Conc µg/kg	MDL µg/kg	Conc µg/kg	MDL µg/kg
2,4-D	U	200	U	230	U	220	U	220	U	230	U	220
2,4-DB	U	200	U	230	U	220	U	220	U	230	U	220
2,4,5-T	U	40	U	46	U	45	U	43	U	45	U	45
2,4,5-TP (Silvex)	U	40	U	46	U	45	U	43	U	45	U	45
Dalapon	U	1200	U	1400	U	1300	U	1300	U	1400	U	1300
Dicamba	U	60	U	69	U	67	U	65	U	68	U	67
Dichloroprop	U	140	U	160	U	160	U	150	U	160	U	160
Dinoseb	U	14	U	16	U	16	U	15	U	16	U	16
MCPA	U	40000	U	46000	U	45000	U	43000	U	45000	U	45000
MCPP	U	40000	U	46000	U	45000	U	43000	U	45000	U	45000
4-Nitrophenol	U	2500	U	2800	U	2800	U	2700	U	2800	U	2800
Pentachlorophenol	U	2500	U	2800	U	2800	U	2700	U	2800	U	2800
Library search:												
Bentazon	U	—	U	—	U	—	U	—	U	—	U	—
Chloramben	U	—	U	—	U	—	U	—	U	—	U	—
5-Hydroxydicamba	U	—	U	—	U	—	U	—	U	—	U	—
TPH**	U	25	44	29	U	28	U	27	U	28	U	28

**The units for TPH are mg/kg.

Table 1.5 (cont.) Results of the Analysis for Herbicides, Semivolatiles, and TPH in Soil
WA # 3-367 Naples Truck Stop
Based on dry weight

Client ID	3367-006		3367-007		3367-008	
Location	Location 6		Fill		Field Blank	
% Solids	93		94		100	
Parameter	Conc µg/kg	MDL µg/kg	Conc µg/kg	MDL µg/kg	Conc µg/kg	MDL µg/kg
2,4-D	U	220	U	210	U	200
2.4-DB	U	220	U	210	U	200
2,4,5-T	U	43	U	43	U	40
2,4,5-TP (Silvex)	U	43	U	43	U	40
Dalapon	U	1300	U	1300	U	1200
Dicamba	U	65	U	64	U	60
Dichloroprop	U	150	U	150	U	140
Dinoseb	U	15	U	15	U	14
MCPA	U	43000	U	43000	U	40000
MCPP	U	43000	U	43000	U	40000
4-Nitrophenol	U	2700	U	2600	NA	
Pentachlorophenol	U	2700	U	2600	NA	
Library search:						
Bentazon	U	—	U	—	NA	
Chloramben	U	—	U	—	NA	
5-Hydroxydicamba	U	—	U	—	NA	
TPH**	U	27	U	27	NA	

**The units for TPH are mg/kg.

QA/QC for VOC in Soil

Results of the Internal Standard Areas and Surrogate Percent Recoveries for VOC in Soil

Prior to extraction, each sample was spiked with a three component surrogate mixture consisting of 1,2-dichloroethane-d4, toluene-d8, and bromofluorobenzene. The surrogate percent recoveries, listed in Table 2.1, ranged from 84 to 102. All 42 recoveries were within acceptable QC limits. The internal standard areas are also listed in Table 2.1. All 42 internal standard areas were within QC criteria.

Results of the MS/MSD Analysis for VOC in Soil

The sample 3367-002 was chosen for the MS/MSD analysis. The percent recoveries, listed in Table 2.2, ranged from 85 to 98. All ten percent recoveries were within acceptable QC limits. The RPD values also listed in Table 2.2, ranged from 0 (zero) to 5. All five RPD values were within acceptable QC limits.

Table 2.1 Results of the Internal Standard Areas
and Surrogate Percent Recoveries for VOC in Soil
WA# 3-367 Naples Truck Stop

			Internal Standards			Surrogates			
	Sample #	Data File	1 area	2 area	3 area	DIC %	TOL %	BRO %	
CAL CHECK	50 PPB VOC	>A5194	33172	195049	171003	NA	NA	NA	
SAND BLANK		>A5195	38893	214918	185511	85	94	95	
_____	3367-001	>A5196	34660	191716	155979	84	96	93	
_____	3367-004	>A5199	37351	212264	173880	86	96	93	*O

SURROGATE LIMITS SOIL

S1 (DIC) = 1,2-Dichloroethane-d4	(70-121)	*A = Area is > 200% or < 50% of Cal Check
S2 (TOL) = Toluene-d8	(81-117)	*R = RT is Plus or Minus .5 min. of Cal Check
S3 (BRO) = Bromofluorobenzene	(74-121)	*O = There is a compound in the sample over 200

Table 2.1 (cont.) Results of the Internal Standard Areas and Surrogate Percent Recoveries for VOC in Soil
WA# 3-367 Naples Truck Stop

	Sample #	Data File	Internal Standards 1 area	2 area	3 area	Surrogates DIC %	TOL %	BRO %
CAL CHECK	50 PPB VOC	>A5201	34912	206601	166917	NA	NA	NA
SAND BLANK		>A5202	33913	193970	158984	95	99	101
_____	3367-009	>A5203	34908	202724	167236	95	98	102
_____	3367-008	>A5204	37027	206475	171130	93	96	101
_____	3367-007	>A5205	31701	186945	153822	96	98	98
_____	3367-006	>A5206	32996	192237	155799	96	99	96
_____	3367-005	>A5207	36160	205623	173326	97	97	100
_____	3367-003	>A5208	34184	193715	160359	95	97	99
_____	3367-002	>A5209	34205	200386	173621	96	95	101
_____	3367-002MS	>A5210	33449	190733	159305	95	96	97
_____	3367-002MSD	>A5211	30756	183943	149663	95	98	97
_____	3367-004 2X	>A5212	35084	203297	168511	95	97	99

SURROGATE LIMITS	SOIL
S1 (DIC) = 1,2-Dichloroethane-d4	(70-121)
S2 (TOL) = Toluene-d8	(81-117)
S3 (BRO) = Bromofluorobenzene	(74-121)

*A = Area is > 200% or < 50% of Cal Check
*R = RT is Plus or Minus .5 min. of Cal Check
*O = There is a compound in the sample over 200

Table 2.2 Results of the MS/MSD Analysis for VOC in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

Sample ID: 3367-002

Compound Name	Sample Conc. (µg/kg)		MS Spike Added (µg/kg)	MSD Spike Added (µg/kg)	MS Conc. (µg/kg)	MSD Conc. (µg/kg)	MS % Rec.	MSD % Rec.	% RPD	QC Limits RPD	QC Limits % Rec.
1,1-Dichloroethene		U	56.8	56.8	48.0	50.2	85	88	5	22	59 - 172
Trichloroethene		U	56.8	56.8	52.4	52.4	92	92	0	24	62 - 137
Benzene		U	56.8	56.8	55.8	55.2	98	97	1	21	66 - 142
Toluene		U	56.8	56.8	53.3	54.3	94	96	2	21	59 - 139
Chlorobenzene		U	56.8	56.8	53.7	54.9	95	97	2	21	60 - 133

QA/QC for Pesticide/PCB in Soil

Results of the Surrogate Recoveries for Pesticides/PCB in Soil

Prior to extraction, each sample was spiked with the surrogates tetrachloro-m-xylene and decachlorobiphenyl. The surrogate percent recoveries, listed in Table 2.3, ranged from 95 to 126. All twenty-two surrogate percent recoveries were within acceptable QC limits.

Results of the MS/MSD Analysis for Pesticide/PCB in Soil

The sample 3367-002 was chosen for the matrix spike/matrix spike duplicate (MS/MSD) analysis. The percent recoveries, listed in Table 2.4, ranged from 35 to 106. Ten out of twelve percent recoveries were within the acceptable QC limits. The RPD values, also listed in Table 2.4, ranged from 0 (zero) to 6. All six RPD values were within the acceptable QC limits.

Table 2.3 Results of the Surrogate Recoveries for Pesticide/PCB in Soil WA# 3-367 Naples Truck Stop

Sample ID	Percent Recovery TCMX	DCBP
SBLK110498	105	126
3367-001	95	106
3367-002	98	109
3367-002MS	106	118
3367-002MSD	105	126
3367-003	100	114
3367-004	105	122
3367-005	110	121
3367-006	108	120
3367-007	104	114
3367-008	98	109

	ADVISORY QC Limits
Tetrachloro-m-xylene (TCMX)	60-150
Decachlorobiphenyl (DCBP)	60-150

Table 2.4 Results of the MS/MSD Analysis for Pesticide/PCB in Soil
WA# 3-367 Naples Truck Stop
Based on dry weight

Sample ID: 3367-002

Compound	Sample Conc µg/kg	MS Spike Added µg/kg	MS Conc µg/kg	MS % Rec		MSD Spike Added µg/kg	MSD Conc µg/kg	MSD % Rec		RPD	Advisory QC Limits % Rec	Advisory QC Limits RPD
g-BHC	U	23.755	8.511	36	*	23.755	8.397	35	*	3	46-127	50
Heptachlor	U	23.755	20.446	86		23.755	21.143	89		3	35-130	31
Aldrin	U	23.755	24.357	103		23.755	24.502	103		0	34-132	43
Dieldrin	U	47.510	50.195	106		47.510	50.375	106		0	31-134	38
Endrin	U	47.510	48.171	101		47.510	48.887	103		2	42-139	45
p,p'-DDT	U	47.510	23.931	50		47.510	24.977	53		6	23-134	50

QA/QC for Metals in Soil

Results of the Matrix Spike Analysis for Metals in Soil

The sample 3367-002 was chosen for the matrix spike (MS) analysis. The percent recoveries, listed in Table 2.5, ranged from 26 to 131. Seventeen out of nineteen percent recoveries were within acceptable QC limits.

Results of the LCS Analysis for Metals in Soil

The percent recoveries for the LCS analysis, listed in Table 2.6, ranged from 72 to 89. All twenty-five recovered concentrations were within acceptable QC limits.

Results of the Duplicate Analysis for Metals in Soil

The sample 3367-002 was chosen for the duplicate analysis. The reported RPD values, listed in Table 2.7, ranged from 1 (one) to 44. Fourteen out of nineteen reported RPD values were within the acceptable QC limits. RPD values were not calculated for antimony, cadmium, mercury, selenium, silver, and thallium since one or both of the results for these metals was below the MDL (U).

Table 2.5 Results of the Matrix Spike Analysis for Metals in Soil
WA # 3-367 Naples Truck Stop
Based on dry weight

Sample: 3367-002

Metal	Sample Conc. mg/kg	Spike Added mg/kg	Matrix Spike Conc. mg/kg	MS % Recovery	QC Limits %Rec.
Antimony	U	12.97	3.40	26 *	75-125
Arsenic	5.2503	5.19	12.08	131 *	75-125
Barium	149.6485	259.40	413.22	102	75-125
Beryllium	0.5123	6.49	6.54	93	75-125
Cadmium	U	6.49	5.99	92	75-125
Chromium	9.799	25.94	35.13	98	75-125
Cobalt	4.1868	64.85	61.00	88	75-125
Copper	9.9844	32.43	42.64	101	75-125
Lead	9.1595	2.59	12.16	116	75-125
Manganese	210.2827	64.85	281.62	110	75-125
Mercury	U	0.65	0.60	93	75-125
Nickel	9.4942	64.85	67.43	89	75-125
Selenium	U	1.30	1.30	100	75-125
Silver	U	6.49	6.39	98	75-125
Thallium	U	6.49	5.26	81	75-125
Vanadium	20.3476	64.85	82.75	96	75-125
Zinc	30.262	64.85	91.46	94	75-125
Boron	9.8962	259.40	228.15	84	75-125
Molybdenum	0.7528	259.40	253.05	97	75-125

Table 2.6 Results of the LCS Analysis for Metals in Soil
WA # 3-367 Naples Truck Stop

Compound Name	True Value (mg/kg)	Found Value (mg/kg)	LCS % Rec.	QC Limits (mg/kg)
Aluminum	5720.0	4521.2	79	3760 - 7690
Antimony	26.6	20.4	77	3.5 - 49.6
Arsenic	163.0	142.8	88	102 - 225
Barium	195.0	141.1	72	128 - 261
Beryllium	78.9	66.2	84	56.5 - 101
Cadmium	114.0	91.3	80	84.9 - 142
Calcium	1280.0	1027.0	80	903 - 1660
Chromium	175.0	142.8	82	121 - 229
Cobalt	73.7	58.4	79	51.8 - 95.6
Copper	91.0	78.7	87	64.6 - 117
Iron	9080.0	6802.0	75	4830 - 13300
Lead	66.0	55.3	84	44.7 - 87.3
Magnesium	1210.0	1014.0	84	888 - 1530
Manganese	261.0	215.2	83	204 - 319
Mercury	1.8	1.6	89	1.0 - 2.6
Nickel	68.3	52.9	78	38.1 - 98.6
Potassium	1500.0	1272.9	85	957 - 2040
Selenium	123.0	104.6	85	91.4 - 155
Silver	57.2	49.3	86	40.8 - 73.5
Sodium	1380.0	1090.0	79	939 - 1830
Thallium	80.0	68.9	86	45.8 - 114
Vanadium	95.4	76.2	80	65.1 - 126
Zinc	190.0	159.5	84	144 - 236
Boron	121.0	89.8	74	81.8 - 161
Molybdenum	112.0	94.4	84	78.9 - 146

Table 2.7 Results of the Duplicate Analysis for Metals in Soil
WA # 3-367 Naples Truck Stop
Based on dry weight

Sample ID: 3367-002

Compound Name	Sample Conc. (mg/kg)	Dup Conc. (mg/kg)	% RPD	QC Limits % RPD
Aluminum	7700.7782	5680.1232	30 *	20
Antimony	U	U	NC	20
Arsenic	5.2503	5.8223	10	20
Barium	149.6485	190.3126	24 *	20
Beryllium	0.5123	0.5032	2	20
Cadmium	U	0.4669	NC	20
Calcium	42839.0713	46439.1881	8	20
Chromium	9.7990	6.8080	36 *	20
Cobalt	4.1868	3.5396	17	20
Copper	9.9844	9.8547	1	20
Iron	9438.5045	8034.0285	16	20
Lead	9.1595	9.3217	2	20
Magnesium	6393.0856	6031.4955	6	20
Manganese	210.2827	232.7613	10	20
Mercury	U	U	NC	20
Nickel	9.4942	8.4436	12	20
Potassium	2130.5136	1560.9663	31 *	20
Selenium	U	0.4475	NC	20
Silver	U	U	NC	20
Sodium	211.4838	329.8470	44 *	20
Thallium	U	U	NC	20
Vanadium	20.3476	18.1920	11	20
Zinc	30.2620	26.7276	12	20
Boron	9.8962	8.5992	14	20
Molybdenum	0.7523	0.8949	17	20

QA/QC for Herbicides, Semivolatiles, and TPH in Soil

Results of the Surrogate Recoveries for Herbicides and Semivolatiles in Soil

Prior to extraction, each sample was spiked with the surrogate 2,4-dichlorophenylacetic acid for herbicides analysis and the six surrogates 2-fluorophenol, phenol-d5, nitrobenzene-d5, 2-fluorophenyl, 2,4,6-tribromophenol, and p-terphenyl-d14 for semivolatiles analysis. The surrogate percent recoveries, listed in Table 2.8, ranged from 50 to 207. All twelve herbicides surrogate percent recoveries were within the acceptable QC limits. Sixty-three out of 66 semivolatiles surrogate percent recoveries were within the acceptable QC limits.

Results of the MS/MSD Analysis for Herbicides, Semivolatiles, and TPH in Soil

The sample 3367-002 was chosen for the matrix spike/matrix spike duplicate (MS/MSD) analysis. The percent recoveries, listed in Table 2.9, ranged from 3 to 131. Twenty-four out of 26 percent recoveries were within the acceptable QC limits. The RPD values, also listed in Table 2.9, ranged from 2 to 37. All thirteen RPD values were within the acceptable QC limits.

Results of the LCS Analysis for Herbicides, Semivolatiles, and TPH in Soil

The percent recoveries for the LCS analyses, listed in Table 2.10, ranged from 0 (zero) to 114. Twelve out of thirteen percent recoveries were within the acceptable QC limits.

Table 2.8 Results of the Surrogate Recoveries for Herbicides and Semivolatiles in Soil
WA # 3-367 Naples Truck Stop

Client ID	Method Blank	3367-001	3367-002	3367-003	3367-004	
Location	Lab	Location 1	Location 2	Location 3	Location 4	
% Solids	—	87	89	92	88	
Surrogate	(%)	(%)	(%)	(%)	(%)	QC Limits (%)
Herbicides:						
2,4-Dichlorophenylacetic acid	129	115	112	120	109	(50 - 150)
Semivolatiles:						
2-Fluorophenol	66	64	68	67	71	(25 - 121)
Phenol-d5	71	74	75	78	82	(24 - 113)
Nitrobenzene-d5	62	59	62	64	67	(23 - 120)
2-Fluorobiphenyl	76	72	76	87	86	(30 - 115)
2,4,6-Tribromophenol	92	106	100	106	105	(19 - 122)
p-Terphenyl-d14	135	135	132	135	133	(18 - 137)

Table 2.8 (cont.) Results of the Surrogate Recoveries for Herbicides and Semivolatiles in Soil
WA # 3-367 Naples Truck Stop

Client ID	3367-005	3367-006	3367-007	3367-008	
Location	Location 5	Location 6	Fill	Field Blank	
% Solids	89	93	94	100	
Surrogate	(%)	(%)	(%)	(%)	QC Limits (%)
Herbicides:					
2,4-Dichlorophenylacetic acid	116	136	113	122	(50 - 150)
Semivolatiles:					
2-Fluorophenol	78	79	94	NA	(25 - 121)
Phenol-d5	86	90	66	NA	(24 - 113)
Nitrobenzene-d5	72	76	89	NA	(23 - 120)
2-Fluorobiphenyl	90	97	200 *	NA	(30 - 115)
2,4,6-Tribromophenol	107	107	207 *	NA	(19 - 122)
p-Terphenyl-d14	135	135	147 *	NA	(18 - 137)

Table 2.8 (cont.) Results of the Surrogate Recoveries for Herbicides and Semivolatiles in Soil
WA # 3-367 Naples Truck Stop

Client ID	3367-002MS	3367-002MSD	LCS	
Location	Location 2	Location 2	—	
% Solids	89	89	—	
Surrogate	(%)	(%)	(%)	QC Limits (%)
Herbicides:				
2,4-Dichlorophenylacetic acid	123	116	127	(50 - 150)
Semivolatiles:				
2-Fluorophenol	60	59	51	(25 - 121)
Phenol-d5	69	71	59	(24 - 113)
Nitrobenzene-d5	59	58	50	(23 - 120)
2-Fluorobiphenyl	71	73	62	(30 - 115)
2,4,6-Tribromophenol	100	100	98	(19 - 122)
p-Terphenyl-d14	123	129	125	(18 - 137)

Table 2.9 Results of the MS/MSD Analysis for Herbicides, Semivolatiles, and TPH in Soil
WA# 3-367 Naples Truck Stop
Based on wet weight

Sample ID: 3367-002

Compound	Sample Conc µg/kg		MS Spike Added µg/kg	MS Conc µg/kg	MS % Rec		MSD Spike Added µg/kg	MSD Conc µg/kg	MSD % Rec		RPD	Advisory QC Limits % Rec	Advisory QC Limits RPD
Herbicides:													
Dalapon	U		1248	180	14		1248	198	16		10	10 - 150	40
MCPA	U		49900	51168	102		49900	55370	111		8	10 - 150	40
Dicamba	U		49.9	26.7	53		49.9	28.0	56		5	10 - 150	40
MCPP	U		49900	65343	131		49900	50684	101		25	10 - 150	40
Dichloroprop	U		499	506	101		499	490	98		3	10 - 150	40
2,4-D	U		499	500	100		499	447	89		11	48 - 214	40
2,4,5-TP (Silvex)	U		49.9	47.0	94		49.9	40.1	80		16	58 - 168	40
2,4,5-T	U		49.9	53.2	106		49.9	43	86		22	40 - 140	40
Dinoseb	U		250	6.91	3	*	250	10.0	4	*	37	10 - 150	40
2,4-DB	U		499	472	94		499	442	89		7	40 - 140	40
Semivolatiles:													
4-Nitrophenol	U		5000	5476	110		5000	5597	112		2	25 - 141	40
Pentachlorophenol	U		5000	4824	97		5000	5010	100		4	38 - 146	40
TPH**	U		250	257	103		250	262	105		2	47 - 139	30

**The units for TPH are mg/kg.

Table 2.10 Results of the LCS Analysis for Herbicides, Semivolatiles, and TPH in Soil
WA # 3-367 Naples Truck Stop

Compound Name	True Value (µg/kg)	Found Value (µg/kg)	LCS % Rec.	QC Limits (%)
Herbicides:				
Dalapon	1250	749	60	10 - 150
MCPA	50000	51618	103	10 - 150
Dicamba	50	55.0	110	10 - 150
MCPP	50000	56800	114	10 - 150
Dichloroprop	500	534	107	10 - 150
2,4-D	500	528	106	48 - 214
2,4,5-TP (Silvex)	50	49.4	99	58 - 168
2,4,5-T	50	47.2	94	40 - 140
Dinoseb	250	0	0 *	10 - 150
2,4-DB	500	506	101	40 - 140
Semivolatiles:				
4-Nitrophenol	5000	5534	111	25 - 141
Pentachlorophenol	5000	4805	96	38 - 146
TPH**	250	253	101	76 - 115

**The units for TPH are mg/kg.

USEPA ERT

CHAIN OF CUSTODY RECORD

COC # 3367-0004

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200 3367
WO#: 03347-143-001-3898-01
EPA Contract 68-C4-0022 (8)

110498-

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:0146
Lab: REAC
Contact: Charles Gasser

LAB #	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
774	E	3367-001	Location 1	Soil	11/2/98	8 oz glass/4 C	Pesticides/PCB		
775	E	3367-002	Location 2	Soil	11/2/98	8 oz glass/4 C	Pesticides/PCB	Yes	
776	E	3367-003	Location 3	Soil	11/2/98	8 oz glass/4 C	Pesticides/PCB		
777	E	3367-004	Location 4	Soil	11/2/98	8 oz glass/4 C	Pesticides/PCB		
778	E	3367-005	Location 5	Soil	11/2/98	8 oz glass/4 C	Pesticides/PCB		
779	E	3367-006	Location 6	Soil	11/2/98	8 oz glass/4 C	Pesticides/PCB		
780	E	3367-007	Fill	Soil	11/2/98	8 oz glass/4 C	Pesticides/PCB		
781	E	3367-008	Field Blank	Soil	11/2/98	8 oz glass/4C	Pesticides/PCB		

Special Instructions:
QC: RAS

REFERENCE COC:

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/98	C Gasser	11/4/98	10:00	All Analysis	C Gasser	11/4/98	[illegible]		

USEPA ERT

CHAIN OF CUST[illegible]Y RECORD

COC # [illegible]67-0005

Page No.: 1 of 1

NEAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200
WO#: 03947-143-001 3361-01
EPA Contract 68-04-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Cooler #:
Lab: Galson
Contact: Ann Weaver

L46825-3 IS
L46825-4 MSD

Lab #	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
	D	3361-001	Location 1	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B		
L46825-1	D	3361-002	Location 2	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B	yes	
	D	3361-003	Location 3	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B		
L46825-5	D	3361-004	Location 4	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B		
	D	3361-005	Location 5	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B		
L46825-6	D	3361-006	Location 6	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B		
L46825-7	D	3361-007	Fill	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B		
	D	3361-008	Field Blank	Soil	11/2/06	8 oz glass/4 C	TAL metals + Mo, B		
L46825-8									
L46825-9									
L46825-10									

Special Instructions:
QC: MS

REFERENCE COC:

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/06	T. L	11/3/06	1145						

USEPA ERT

CHAIN OF CUSTODY RECORD

COC # 3367-0008

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200 3367
WO#: 03347-143-001-3369-01
EPA Contract 68-C4-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:
Lab: REAC
Contact: Charles Gasser

110498-

LAB #	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
765	H	3367-001	Location 1	Soil	11/2/98	4 oz. sept/4 C	Volatiles		
766	H	3367-002	Location 2	Soil	11/2/98	4 oz. sept/4 C	Volatiles	YES	
767	H	3367-003	Location 3	Soil	11/2/98	4 oz. sept/4 C	Volatiles		
768	H	3367-004	Location 4	Soil	11/2/98	4 oz. sept/4 C	Volatiles		
769	H	3367-005	Location 5	Soil	11/2/98	4 oz. sept/4 C	Volatiles		
770	H	3367-006	Location 6	Soil	11/2/98	4 oz. sept/4 C	Volatiles		
771	H	3367-007	Fill	Soil	11/2/98	4 oz. sept/4 C	Volatiles		
772	H	3367-008	Field Blank	Soil	11/2/98	40 ml VOA/4 C	Volatiles		
773	H	3367-009	Trip Blank	Soil	11/2/98	40 ml VOA/4C	Volatiles		

Special Instructions:
QC: PA

REFERENCE COC:

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All/Analysis	Jennifer Royce	11/3/98	C. Gasser	11/4/98	10:00	All/Analysis	C. Gasser	11/4/98	Fed Ex	11/4/98	1025

PA ERT

CHAIN OF CUSTODY RECORD

COC # 338[illegible]007

, Edison, NJ
at: Jennifer Royce
321-4200
03947-143-001-9367-01
Contract 68-C4-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:6383
Lab: Kemron Environmental
Contact: Cindy Arnold

#	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
	B	3367-001	Location 1	Soil	11/2/98	8 oz glass/4 C	TPH		
	C	3367-001	Location 1	Soil	11/2/98	8 oz glass/4 C	Herbicides		
	B	3367-002	Location 2	Soil	11/2/98	8 oz glass/4 C	TPH		
	C	3367-002	Location 2	Soil	11/2/98	8 oz glass/4 C	Herbicides	Yes	
	B	3367-003	Location 3	Soil	11/2/98	8 oz glass/4 C	TPH		
	C	3367-003	Location 3	Soil	11/2/98	8 oz glass/4 C	Herbicides		
	B	3367-004	Location 4	Soil	11/2/98	8 oz glass/4 C	TPH		
	C	3367-004	Location 4	Soil	11/2/98	8 oz glass/4 C	Herbicides		
	B	3367-005	Location 5	Soil	11/2/98	8 oz glass/4 C	TPH		
	C	3367-005	Location 5	Soil	11/2/98	8 oz glass/4 C	Herbicides		
	B	3367-006	Location 6	Soil	11/2/98	8 oz glass/4 C	TPH		
	C	3367-006	Location 6	Soil	11/2/98	8 oz glass/4 C	Herbicides		
	B	3367-007	Fill	Soil	11/2/98	8 oz glass/4 C	TPH		
	C	3367-007	Fill	Soil	11/2/98	8 oz glass/4 C	Herbicides		
	C	3367-008	Field Blank	Soil	11/2/98	8 oz glass/4 C	Herbicides		

Instructions:
: RM

REFERENCE COC:

Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
Analysis	Jennifer Royce	11/3/98									

Roy F. Weston, Inc.
GSA Raritan Depot
Bldg. 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
732-321-4200 • Fax 732-494-4021

Galson Technical Services
6601 Kirkville Road
East Syracuse, NY 13057

Attn: Pam Weaver

13 October 1998

Project # 3347-143-001-3367 Naples Truck

As per Weston REAC Purchase Order number 97667, please analyze samples according to the following parameters:

Analysis/Method	Matrix	# of samples
TAL Metals plus Mo & B \ SW-846-6010 or Series 7000	Soil	6
Data package: see attached Deliverables Requirements		

Samples are expected to arrive at your laboratory on October 21, 1998. **All applicable QA/QC (MS/MSD) analysis as per method, will be performed on our sample matrix.** The complete data package is due 21 business days after receipt of last batch of samples. The complete data package must include all items on the deliverables checklist. **Expect all samples to be difficult matrix and all raw data must be included in final analytical report.**

All sample and QC(ie MS/MSD, LCS, Duplicates , and Blanks) results must be summarized in a Quattro Pro diskette deliverable.

Please submit all reports and technical questions concerning this project to **John Johnson at (732) 321-4248 or fax to (732) 321-4392**. Any contractual question, please call Cynthia Lentini at (732) 321-4296.

Sincerely,

Misty Barkley
Data Validation and Report Writing Group Leader
Roy F. Weston, Inc. / REAC Project

MB:jj Attachments

cc: R. Singhvi
H. Compton
3367\non\mem\9810\sub\3367Con
V. Kansal
Subcontracting File
C. Gasser
C. Lentini
J. Royce
M. Barkley

Roy F. Weston, Inc.
GSA Raritan Depot
Bldg. 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
732-321-4200 • Fax 732-494-4021

Kemron Environmental Services
109 Starlite Park
Marietta, OH 45750

Attn: Cindy Arnold

4 November 1998

Project # 3347-143-001-3367 Naples Truck Stop

As per Weston REAC Purchase Order number 98389, please analyze samples according to the following parameters:

Analysis/Method	Matrix	# of samples
Herbicides\ SW-846-8151\ See compound list	Soil	6
Semivolatiles \ SW-846-8270\ See compound list	Soil	6
TPH\ Modified EPA 418.1	Soil	6
Data package: Package with Diskette Deliverable		

Samples are expected to arrive at your laboratory the week of November 2,1998. **All applicable QA/QC (MS/MSD) analysis as per method, will be performed on our sample matrix.** Preliminary sample result tables plus a signed copy of our Chain of Custody must be faxed to REAC 10 business days after receipt of the last samples. The complete data package is due 21 business days after receipt of last batch of samples. The complete data package must include all items on the deliverables checklist. **Expect all samples to be difficult matrix and all raw data must be included in final analytical report.**

ALL ORGANIC EXTRACTIONS ON SOLIDS IE: BNA,PEST/PCB MUST BE BY SOXHLET EXTRACTION

All sample and QC results(ie: MS/MSD, LCS, Duplicates and Blanks) must be summarized in a Quattro Pro diskette deliverable.

Please submit all reports and technical questions concerning this project to **John Johnson at (732) 321-4248 or fax** to (732) 321-4392. Any contractual question, please call Cynthia Lentini at (732) 321-4296.

Sincerely,

Misty Barkley
Data Validation and Report Writing Group Leader
Roy F Weston, Inc. / REAC Project

MB jj Attachments

cc R. Singhvi
H. Compton
3367\non\mem\9811\sub\3367Con4
V. Kansal
Subcontracting File
C. Gasser
C. Lentini
J. Royce
M. Barkley

Naples Truck Stop

Herbicides

2,4-D
2,4-DB
2,4,5-TP
Silvex
2,4,5-T
Dalapon
Dicamba
Dichloroprop
Dinoseb
MCPA

Semivolatiles

4-Nitrophenol
Pentachlorophenol

Library Search
Bentazon
Chloramben
5-Hydroxydicamba

Roy F. Weston, Inc.
GSA Raritan Depot
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2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
732-321-4200 • Fax 732-494-4021

15 December 1998

Ms. Cindy Arnold
Kemron Environmental Services
109 Starlite Park
Marietta, OH 45750

Dear Ms. Arnold:

During review of the total petroleum hydrocarbon/herbicide/semivolatiles data package for the Naples Truck project (Kemron Login No. L9811089) , several observations were made which require clarification or additional information.

Total Petroleum Hydrocarbons

1. What is the basis for analyte reporting limit of 25 mg/kg? Based on the lowest calibration standard and the weight used, the RDL should be 50 mg/kg.

2. What is the concentration of spike solution ES 26-04?

Herbicides

1. What is the concentration of each analyte in the various calibration solutions used (S 38-16, S 35-01) and in the spike solution (ES 25-02) used for the LCS and MS/MSD samples. Also include the preparation dates for these solutions.

2. What is the basis for the herbicide reporting limits? If MDL study, please provide information.

3. Why is the NA qualifier used for MCPP hits on the raw data quant report pages for samples L9811089-01, -08, and -09? MCPP appears to be above the low end of the calibration range. RL is higher for MCPP?

Semivolatiles

1. Results not reported for sample L9811089-10. Sample does not appear on extraction log. Please explain.

2. What is the basis for the reporting limits? In the QC summary tables the blank reporting limits are 500 µg/kg and in the results tables all sample reporting limits are 16-17 µg/kg. Also, the dilutions are listed as 3 in the final results tables, but are listed as 1 on the analysis runlogs. Please explain.

Your prompt attention will be appreciated. We request response within two days of fax receipt of this letter. If you should have any questions concerning the above, you may contact our reviewer for this project, Joe Tomaszewicz, at 732-321-4297.

Sincerely,

for Misty Barkley
Data Validation and Report Writing Group Leader
Roy F. Weston, Inc./REAC Project

APPENDIX B
Final Agronomic Results
Naples Truck Stop Site
Final Report
April 1999

Roy F. Weston, Inc.
GSA Raritan Depot
Bldg. 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
732-321-4200 • Fax 732-494-4021

DATE: 11/17/98

TO: R. Singhvi, ERTC/EPA

FROM: Misty Barkley, Data Validation and Report Writing Group Leader

SUBJECT: Preliminary Results of Project Naples Truck WA# 3367

Attached please find the preliminary results of the above referenced project for the following samples.

Chain of Custody No.	Analyses
3367-0002	7 soil samples for TOC, % Moisture, Soluable salts, Mn, Zn, and Cu.

These samples are identified on the chain of custody as Agronomic II. There will be no QA/QC done on this data so these results should be considered as final.

cc: Archives
Subcontracting
Misty Barkley
WAM: M. Sprenger/ H. Compton
Task Leader: J. Royce

PENNSTATE

(814) 863-0841 Fax (814) 863-4540
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park PA 16802

November 13, 1998

John Johnson
Weston-REAC
2890 Woodbridge Ave
Edison, NJ 08837

SOIL TEST RESULTS

Sample Id	Lab No	*Total Soluble Salts (mmhos/cm)	Total Carbon (%)	Moisture (%)	**Available Mn	Cu	Zn
					----------ug/g----------		
3367-001	5682	.58	2.33	14.2	6.712	0.375	3.443
3367-002	5683	.93	1.72	11.6	25.25	0.995	1.531
3367-003	5684	1.17	3.17	8.6	5.424	0.463	0.794
3367-004	5685	.97	2.60	13.0	5.582	0.263	0.677
3367-005	5686	.65	2.31	10.6	2.523	0.343	0.635
3367-006	5687	.21	1.30	7.6	77.28	1.099	1.508
3367-007	5688	.36	1.01	6.6	25	0.487	1.13

* 1:5 Soil:Water
** Mehlich 3

Soluble Salts (Conductance) Interpretation for Soils*

Conductance (mmhos/cm)	Effects
<0.40	Salinity effects mostly negligible, excepting possibly beans and carrots.
0.40-0.80	Very slightly saline; but yields of very salt sensitive crops such as flax, clovers (alsike, red), carrots, onions, bell peppers, lettuce, sweet potatoes may be reduced by 25 to 50%.
0.81-1.20	Moderately saline. Yield of salt-sensitive crops restricted. Seedlings may be injured. Satisfactory for well drained greenhouse soils. Crop yields reduced by 25 to 50% may include broccoli and potato plus the other plants above.
1.21-1.60	Saline soils. Crops tolerant include cotton, alfalfa, cereals, grain sorghum, sugar beets, bermuda grass, tall wheat grass and Harding grass. Salinity higher than desirable for greenhouse soils.
1.61-3.20	Strongly saline. Only salt-tolerant crops yield satisfactory. For greenhouse crops leach soil with enough water so that 2-4 quarts (2-4 L) pass through each square foot (0.1 m^2) of bench area, or one pint of water (0.5 L) per 6 inch (15 cm) pot; repeat after 1 hour. Repeat again if readings are still in the high range.
>3.2	Very strongly saline. Only salt-tolerant grasses, herbaceous plants, certain shrubs and trees will grow.

*2:1 Water:Soil ratio

USEPA ERT

CHAIN OF CUSTODY RECORD

COC # 3367-0002

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200
WO#: 03347-143-001 3367-01
EPA Contract 68-C4-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:
Lab: Penn State
Contact: Ann Wolf

LAB #	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
	A	3367-001	Location 1	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
	A	3367-002	Location 2	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
	A	3367-003	Location 3	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
	A	3367-004	Location 4	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
	A	3367-005	Location 5	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
	A	3367-006	Location 6	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
	A	3367-007	FB	Soil	11/2/98	8 oz glass/4 C	Agronomics II		

Special Instructions:
Agronomics II = Available Macronutrients Ca, Mg, K, pH, CEC, Available Micronutrients Mn, Zn, Cu, Soluble Salts, TOC, Percent Moisture

REFERENCE COC:

qc: KM

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/98									

Roy F. Weston, Inc.
GSA Raritan Depot
Bldg. 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
732-321-4200 • Fax 732-494-4021

DATE: 12/01/98

TO: R.Singhvi, ERTC/EPA

FROM: Misty Barkley, Data Validation and Report Writing Group Leader

SUBJECT: Preliminary Results of Project Naples Truck Stop WA# 3367

Attached please find the preliminary results of the above referenced project for the following samples.

Chain of Custody No.	Analyses
3367-0001	7 soil samples for Av. PO4, Cl, B, SO4, pH, Lime requirement, TKN, Ammonia, Nitrate, Nitrite, Grain Size, and Specific Gravity.

These samples are listed on the chain of custody as Agronomic I. There will be no QA\QC done on this data so these results can be considered as final.

cc: Archives
Subcontracting
Misty Barkley
WAM: H. Compton
Task Leader: J. Royce

A & L EASTERN AGRICULTURAL LABORATORIES, INC.

7621 Whitepine Road • Richmond, Virginia 23237-2296 • Phone: 804-743-9401 • Fax: 804-271-6446

WO# 03347-143-001-3367-01
Project Name:
Naples Truck Stop
EPA Contract 66-C4-0022

Roy F Weston Inc.
Bldg 209 Annex (Bay F)
2890 Woodbridge Ave.
Edison NJ 08837-3679

Report Number
R310-001
11/23/98

Customer Sample Number	Lab Number	Available Phosphorus mg/kg	Chloride mg/kg	Boron mg/kg	Sulfate-S mg/kg	Soil pH	SMP Buffer pH	Lime Requirement Ton/Acre
3367-001	6841	9	137	0.8	373	8.0	N.A.	0.0
3367-002	6842	22	131	2.3	943	8.0	N.A.	0.0
3367-003	6843	7	162	2.0	1056	8.1	N.A.	0.0
3367-004	6844	8	38	3.0	807	8.2	N.A.	0.0
3367-005	6845	11	25	1.8	419	8.1	N.A.	0.0
3367-006	6846	85	20	0.6	15	8.3	N.A.	0.0
3367-007	6847	14	111	0.3	99	8.4	N.A.	0.0

N.A.: No SMP Buffer pH for soil pH greater than 7.0
Lime requirement to soil pH 7.0

Analysis	Methodology
Available Phosphorus	Mehlich 3
Chloride	Method of Soil Analysis 26-3.5
Boron	Hot water extraction
Sulfate-S	Acidified ammonium acetate extraction
Soil pH	SW846-9045C
SMP Buffer pH	Method of Soil Analysis 12-3.4.4
Lime Requirement	Method of Soil Analysis 12-3.4.4.5

C Norman Jones, President

Dedicated Exclusively to Providing Quality Analytical Services

A & L EASTERN AGRICULTURAL LABORATORIES, INC.
7621 Whitepine Road • Richmond, Virginia 23237-2296 • Phone: 804-743-9401 • Fax: 804-271-6446

WO# 03347-143-001-3367-01
Project Name:
Naples Truck Stop
EPA Contract 66-C4-0022

Roy F Weston Inc.
Bldg 209 Annex (Bay F)
2890 Woodbridge Ave.
Edison NJ 08837-3679

Report Number
R310-001
11/23/98

Customer Sample Number	Lab Number	TKN mg/kg	Ammonia-N mg/kg	Nitrate-N mg/kg	Nitrite-N mg/kg	% Sand	%Silt	% Clay	Texture Class	Specific Gravity
3367-001	6841	200	12.5	5	0.01	68	12	20	Sandy Loam	2.611
3367-002	6842	200	2.9	16	<0.01	52	44	4	Sandy Loam	2.381
3367-003	6843	200	2.6	1	<0.01	52	44	4	Sandy Loam	2.405
3367-004	6844	200	1.8	13	<0.01	60	36	4	Sandy Loam	2.502
3367-005	6845	200	2.1	13	0.03	58	36	6	Sandy Loam	2.545
3367-006	6846	400	2.3	2	0.12	60	26	14	Sandy Loam	2.564
3367-007	6847	200	1.5	3	0.02	76	12	12	Sandy Loam	2.573

Analysis	Methodology
TKN	EPA 351.3
Ammonia-N	EPA 350.1
Nitrate-N	EPA 353.2
Nitrite-N	EPA 354.1
% Sand	USDA
%Silt	USDA
% Clay	USDA
Texture Class	USDA
Specific Gravity	ASTM D-854

C Noman Jones, President

Dedicated Exclusively to Providing Quality Analytical Services

USEPA Ele:

CHAIN OF CUSTODY RECORD

COC # 3367-0001

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200
WO#: 03347-143-001-3367-01
EPA Contract 68-C4-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:009348
Lab: A & L Eastern Agricultural Lab
Contact: Paul Chu

Lab #	Tag	Sample #	Location	# of Containers	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
	F	3367-001	Location 1	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-002	Location 2	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-003	Location 3	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-004	Location 4	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-005	Location 5	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-006	Location 6	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-007	Fill	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		

Special Instructions:
Agronomics I = Ammonia, Nitrate, Nitrite, TKN, Available P, Sulfate, Chloride, Available Micronutrients B, Grain Size, Specific Gravity, Lime Requirements, Water Holding Capacity

QC: RA

← pH = 7

REFERENCE COC:

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/98									

Roy F. Weston, Inc.
GSA Raritan Depot
Bldg. 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
732-321-4200 • Fax 732-494-4021

DATE: 11/19/98

TO: R.Singhvi, ERTC/EPA

FROM: Misty Barkley, Data Validation and Report Writing Group Leader

SUBJECT: Preliminary Results of Project Naples Truck WA# 3367

Attached please find the preliminary results of the above referenced project for the following samples.

Chain of Custody No.	Analyses
3367-0002	7 soil samples for Macronutrients, pH, CEC.

These samples are identified on the chain of custody as Agronomic II. There will be no QA/QC done on this data so these results should be considered as final.

cc: Archives
Subcontracting
Misty Barkley
WAM: M. Sprenger/ H. Compton
Task Leader: J. Royce

11/10/98	5682	103367	OUT OF STATE	00	336701	UNSPECIFIED
DATE	LAB NO.	SERIAL NO.	COUNTY	ACRES	FIELD	SOIL

AGRICULTURAL ANALYTICAL SERVICES LABORATORY
COLLEGE OF AGRICULTURAL SCIENCES
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802
(814 863-0841)

SOIL TEST REPORT FOR:
JOHN JOHNSON
2890 WOODBRIDGE AVE
EDISON NJ 08837

COPY SENT TO:
JENNIFER ROYCE
2890 WOODBRIDGE AVE
EDISON NJ 08837

SOIL NUTRIENT LEVELS:

		LOW / MEDIUM / HIGH / EXCESSIVE
Soil pH		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Phosphate	(P_2O_5)	X
Potash	(K_2O)	XXX
Magnesium	(MgO)	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Calcium	(CaO)	XXXXXXXXXX

RECOMMENDATIONS FOR: *UNSPECIFIED GARDEN CROP*

See Back For Comments

PH ADJUSTMENT LB/100 SQ.FT.

CALCITIC LIMESTONE (0-3% MG): NONE

MG AND CALCIUM ADJUSTMENT LB/100 SQ.FT.

($MgSO_4$) EPSOM SALTS: NONE — 1,2

($CaSO_4$) GYPSUM: NONE — 3,5

PLANT NUTRIENT NEEDS: LBS/100 SQ.FT.

5-10-10		5-10-5		10-10-10	
2.5	+	NONE	+	NONE	7
0-46-0		**0-0-60**		**UREA**	
1.0	+	NONE	+	NONE	

MESSAGES:

- IF SOIL PH IN LABORATORY RESULTS IS GREATER THAN 6.5, USE SULFUR (SEE TABLE ON BACK) TO LOWER PH TO OPTIMUM LEVEL OF 6.5.
- THE ABOVE LIME AND FERTILIZER RECOMMENDATIONS ARE FOR THIS SOIL SAMPLE AND THIS SEASON ONLY. PLANT NUTRIENT RECOMMENDATIONS ARE FOR FERTILIZERS CONTAINING SPECIFIC RATIOS OF NITROGEN (N), PHOSPHATE (P2O5) AND POTASH (K2O). AS AN EXAMPLE 5-10-10 CONTAINS 5% N, 10% P2O5, AND 10% K2O. IF FERTILIZERS WITH THE RATIOS SHOWN ARE NOT AVAILABLE, CONTACT YOUR LOCAL GARDEN CENTER OR FERTILIZER SUPPLIER FOR THE APPROPRIATE SUBSTITUTION.

LABORATORY RESULTS:

8.0	2	0.0	0.21	8.0	75.0	23.2	0.9	34.2	64.6
SOIL pH	P lb/A	ACIDITY	K	Mg	Ca	CEC	K	Mg	Ca
		EXCHANGEABLE CATIONS (meq/100 g)					% SATURATION		

OTHER TESTS:

COMMENTS

1. To be most effective, all recommended limestone and/or fertilizer should be incorporated 6 to 8 inches into the soil prior to planting. If plants or crop is established, apply recommended materials to the surface and water area well.

2. If 11 to 20 pounds of limestone are recommended, divide the amount by two and apply in two applications six months apart. If 21 or more pounds are recommended, divide the amount by three and make three applications at six month intervals.

3. If 3 or more pounds of MgSO4 (Epsom salts) are recommended, divide the amount by two and make separate applications at four month intervals. If an alternative magnesium source is used, apply an amount equal to the equivalent of 10.5% Mg in MgSO4; ONLY ONE APPLICATION should be needed.

4. When CEC is less than 15 (see laboratory results on front) add one inch of organic matter. If pH is greater than 7, use acid peat moss as the organic matter source.

5. Lime and fertilizer are recommended in pounds of material per each 100 square feet of area to be treated. Use the following conversions to convert from pounds per 100 square feet to other units or area sizes:

   pounds per 100 sq. ft. x 10 = pounds per 1000 sq. ft.
   pounds per 100 sq. ft. x 435 = pounds per acre

6. Amount of sulfer needed to lower soil pH to optimum level.
   (See front of report for soil pH and optimum pH)

FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)	FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)
8.0	7.5	0.50	7.0	6.5	0.75
	7.0	1.00		6.0	1.25
	6.5	2.00		5.5	2.50
	6.0	3.00			
	5.5	4.00			
7.5	7.0	0.75	6.5	6.0	1.00
	6.5	1.25		5.5	1.75
	6.0	2.50			
	5.5	3.50	6.0	5.5	1.50

   Apply sulfur at the above rates for a loam soil. On heavier soil (silt loams) use one third more than the amount shown. On lighter soils (sandy loams) use one-half of the amounts shown. If aluminum or ferrous sulfate is used to lower pH, multiply the above amounts by 2.5. Follow the same suggestions as above for soil types. If 4 or more pounds are needed, divide the amount in half and make two applications six months apart.

7. There is no reliable test for evaluating the amount of nitrogen (N) in soils that is available to crops over the growing season. The N recommended is based on the actual N that needs to be supplied annually to ensure optimum crop growth.

11/10/98	5683	103368	OUT OF STATE	00	336702	UNSPECIFIED
DATE	LAB NO.	SERIAL NO.	COUNTY	ACRES	FIELD	SOIL

AGRICULTURAL ANALYTICAL SERVICES LABORATORY
COLLEGE OF AGRICULTURAL SCIENCES
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802
(814 863-0841)

SOIL TEST REPORT FOR:

JOHN JOHNSON
2890 WOODBRIDGE AVE
EDISON NJ 08837

COPY SENT TO:

JENNIFER ROYCE
2890 WOODBRIDGE AVE
EDISON NJ 08837

SOIL NUTRIENT LEVELS:

	LOW / MEDIUM / HIGH / EXCESSIVE
Soil pH	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Phosphate (P_2O_5)	X
Potash (K_2O)	XXXXXX
Magnesium (MgO)	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Calcium (CaO)	XXXXXXXXX

RECOMMENDATIONS FOR: *UNSPECIFIED GARDEN CROP*

See Back For Comments

MG AND CALCIUM ADJUSTMENT LB/100 SQ.FT.

		Comments
($MgSO_4$) EPSOM SALTS	NONE	1,2
($CaSO_4$) GYPSUM	NONE	3,5

PH ADJUSTMENT LB/100 SQ.FT.

CALCITIC LIMESTONE (0-3% MG)	NONE

PLANT NUTRIENT NEEDS: LBS/100 SQ.FT.

5-10-10		5-10-5		10-10-10	Comments
2.5	+	NONE	+	NONE	7

0-46-0		0-0-60		UREA
1.0	+	NONE	+	NONE

MESSAGES:

- IF SOIL PH IN LABORATORY RESULTS IS GREATER THAN 6.5, USE SULFUR (SEE TABLE ON BACK) TO LOWER PH TO OPTIMUM LEVEL OF 6.5.
- THE ABOVE LIME AND FERTILIZER RECOMMENDATIONS ARE FOR THIS SOIL SAMPLE AND THIS SEASON ONLY. PLANT NUTRIENT RECOMMENDATIONS ARE FOR FERTILIZERS CONTAINING SPECIFIC RATIOS OF NITROGEN (N), PHOSPHATE (P2O5) AND POTASH (K2O). AS AN EXAMPLE 5-10-10 CONTAINS 5% N, 10% P2O5, AND 10% K2O. IF FERTILIZERS WITH THE RATIOS SHOWN ARE NOT AVAILABLE, CONTACT YOUR LOCAL GARDEN CENTER OR FERTILIZER SUPPLIER FOR THE APPROPRIATE SUBSTITUTION.

LABORATORY RESULTS:

8.0	2	0.0	0.44	8.4	75.0	23.8	1.8	35.3	63.0
SOIL pH	P lb/A	ACIDITY	K	Mg	Ca	CEC	K	Mg	Ca
		EXCHANGEABLE CATIONS (meq/100 g)					% SATURATION		

OTHER TESTS:

COMMENTS

1. To be most effective, all recommended limestone and/or fertilizer should be incorporated 6 to 8 inches into the soil prior to planting. If plants or crop is established, apply recommended materials to the surface and water area well.

2. If 11 to 20 pounds of limestone are recommended, divide the amount by two and apply in two applications six months apart. If 21 or more pounds are recommended, divide the amount by three and make three applications at six month intervals.

3. If 3 or more pounds of MgSO4 (Epsom salts) are recommended, divide the amount by two and make separate applications at four month intervals. If an alternative magnesium source is used, apply an amount equal to the equivalent of 10.5% Mg in MgSO4; ONLY ONE APPLICATION should be needed.

4. When CEC is less than 15 (see laboratory results on front) add one inch of organic matter. If pH is greater than 7, use acid peat moss as the organic matter source.

5. Lime and fertilizer are recommended in pounds of material per each 100 square feet of area to be treated. Use the following conversions to convert from pounds per 100 square feet to other units or area sizes:

   pounds per 100 sq. ft. x 10 = pounds per 1000 sq. ft.
   pounds per 100 sq. ft. x 435 = pounds per acre

6. Amount of sulfer needed to lower soil pH to optimum level.
   (See front of report for soil pH and optimum pH)

FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)	FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)
8.0	7.5	0.50	7.0	6.5	0.75
	7.0	1.00		6.0	1.25
	6.5	2.00		5.5	2.50
	6.0	3.00			
	5.5	4.00			
7.5	7.0	0.75	6.5	6.0	1.00
	6.5	1.25		5.5	1.75
	6.0	2.50			
	5.5	3.50	6.0	5.5	1.50

   Apply sulfur at the above rates for a loam soil. On heavier soil (silt loams) use one third more than the amount shown. On lighter soils (sandy loams) use one-half of the amounts shown. If aluminum or ferrous sulfate is used to lower pH, multiply the above amounts by 2.5. Follow the same suggestions as above for soil types. If 4 or more pounds are needed, divide the amount in half and make two applications six months apart.

7. There is no reliable test for evaluating the amount of nitrogen (N) in soils that is available to crops over the growing season. The N recommended is based on the actual N that needs to be supplied annually to ensure optimum crop growth.

11/10/98	5684	103369	OUT OF STATE	00	336703	UNSPECIFIED
DATE	LAB NO.	SERIAL NO.	COUNTY	ACRES	FIELD	SOIL

AGRICULTURAL ANALYTICAL SERVICES LABORATORY
COLLEGE OF AGRICULTURAL SCIENCES
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802
(814 863-0841)

SOIL TEST REPORT FOR

JOHN JOHNSON
2890 WOODBRIDGE AVE
EDISON NJ 08837

COPY SENT TO:

JENNIFER ROYCE
2890 WOODBRIDGE AVE
EDISON NJ 08837

SOIL NUTRIENT LEVELS:

		LOW / MEDIUM / HIGH / EXCESSIVE
Soil pH		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Phosphate	(P_2O_5)	X
Potash	(K_2O)	XXXXX
Magnesium	(MgO)	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Calcium	(CaO)	XXX

RECOMMENDATIONS FOR: *UNSPECIFIED GARDEN CROP*

See Back For Comments

MG AND CALCIUM ADJUSTMENT
LB/100 SQ.FT.

(MgSO4) EPSOM SALTS: NONE — 1,2

PH ADJUSTMENT
LB/100 SQ.FT.

CALCITIC LIMESTONE (0-3% MG): NONE

(CaSO4) GYPSUM: NONE — 3,5

PLANT NUTRIENT NEEDS: LBS/100 SQ.FT.

5-10-10		5-10-5		10-10-10	
2.5	+	NONE	+	NONE	7

0-46-0		0-0-60		UREA
1.0	+	NONE	+	NONE

MESSAGES:

- IF SOIL PH IN LABORATORY RESULTS IS GREATER THAN 6.5, USE SULFUR (SEE TABLE ON BACK) TO LOWER PH TO OPTIMUM LEVEL OF 6.5.
- THE ABOVE LIME AND FERTILIZER RECOMMENDATIONS ARE FOR THIS SOIL SAMPLE AND THIS SEASON ONLY. PLANT NUTRIENT RECOMMENDATIONS ARE FOR FERTILIZERS CONTAINING SPECIFIC RATIOS OF NITROGEN (N), PHOSPHATE (P205) AND POTASH (K20). AS AN EXAMPLE 5-10-10 CONTAINS 5% N, 10% P205, AND 10% K20. IF FERTILIZERS WITH THE RATIOS SHOWN ARE NOT AVAILABLE, CONTACT YOUR LOCAL GARDEN CENTER OR FERTILIZER SUPPLIER FOR THE APPROPRIATE SUBSTITUTION.

LABORATORY RESULTS:

8.1	2	0.0	0.38	10.7	75.0	26.0	1.4	41.0	57.6
SOIL pH	P lb/A	ACIDITY	K	Mg	Ca	CEC	K	Mg	Ca
		EXCHANGEABLE CATIONS (meq/100 g)					% SATURATION		

OTHER TESTS:

SOIL08 HOME GARDEN CROPS

COMMENTS

1. To be most effective, all recommended limestone and/or fertilizer should be incorporated 6 to 8 inches into the soil prior to planting. If plants or crop is established, apply recommended materials to the surface and water area well.

2. If 11 to 20 pounds of limestone are recommended, divide the amount by two and apply in two applications six months apart. If 21 or more pounds are recommended, divide the amount by three and make three applications at six month intervals.

3. If 3 or more pounds of MgSO4 (Epsom salts) are recommended, divide the amount by two and make separate applications at four month intervals. If an alternative magnesium source is used, apply an amount equal to the equivalent of 10.5% Mg in MgSO4; ONLY ONE APPLICATION should be needed.

4. When CEC is less than 15 (see laboratory results on front) add one inch of organic matter. If pH is greater than 7, use acid peat moss as the organic matter source.

5. Lime and fertilizer are recommended in pounds of material per each 100 square feet of area to be treated. Use the following conversions to convert from pounds per 100 square feet to other units or area sizes:

   pounds per 100 sq. ft. x 10 = pounds per 1000 sq. ft.
   pounds per 100 sq. ft. x 435 = pounds per acre

6. Amount of sulfer needed to lower soil pH to optimum level.
   (See front of report for soil pH and optimum pH)

FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)	FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)
8.0	7.5	0.50	7.0	6.5	0.75
	7.0	1.00		6.0	1.25
	6.5	2.00		5.5	2.50
	6.0	3.00			
	5.5	4.00			
7.5	7.0	0.75	6.5	6.0	1.00
	6.5	1.25		5.5	1.75
	6.0	2.50			
	5.5	3.50	6.0	5.5	1.50

   Apply sulfur at the above rates for a loam soil. On heavier soil (silt loams) use one third more than the amount shown. On lighter soils (sandy loams) use one-half of the amounts shown. If aluminum or ferrous sulfate is used to lower pH, multiply the above amounts by 2.5. Follow the same suggestions as above for soil types. If 4 or more pounds are needed, divide the amount in half and make two applications six months apart.

7. There is no reliable test for evaluating the amount of nitrogen (N) in soils that is available to crops over the growing season. The N recommended is based on the actual N that needs to be supplied annually to ensure optimum crop growth.

11/10/98	5685	103370	OUT OF STATE	00	336704	UNSPECIFIED
DATE	LAB NO.	SERIAL NO.	COUNTY	ACRES	FIELD	SOIL

AGRICULTURAL ANALYTICAL SERVICES LABORATORY
COLLEGE OF AGRICULTURAL SCIENCES
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802
(814 863-0841)

SOIL TEST REPORT FOR

JOHN JOHNSON
2890 WOODBRIDGE AVE
EDISON NJ 08837

COPY SENT TO:

JENNIFER ROYCE
2890 WOODBRIDGE AVE
EDISON NJ 08837

SOIL NUTRIENT LEVELS

	LOW	MEDIUM	HIGH	EXCESSIVE
Soil pH	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
Phosphate (P_2O_5)	X			
Potash (K_2O)	X			
Magnesium (MgO)	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
Calcium (CaO)	XXXXXXXXX			

RECOMMENDATIONS FOR *UNSPECIFIED GARDEN CROP*

See Back For Comments

MG AND CALCIUM ADJUSTMENT LB/100 SQ.FT.

($MgSO_4$) EPSOM SALTS: NONE — 1,2

PH ADJUSTMENT LB/100 SQ.FT.

CALCITIC LIMESTONE (0-3% MG): NONE

($CaSO_4$) GYPSUM: NONE — 3,5

PLANT NUTRIENT NEEDS: LBS/100 SQ.FT.

5-10-10		5-10-5		10-10-10	
2.5	+	NONE	+	NONE	7
0-46-0		**0-0-60**		**UREA**	
1.0	+	NONE	+	NONE	

MESSAGES:

- IF SOIL PH IN LABORATORY RESULTS IS GREATER THAN 6.5, USE SULFUR (SEE TABLE ON BACK) TO LOWER PH TO OPTIMUM LEVEL OF 6.5.
- THE ABOVE LIME AND FERTILIZER RECOMMENDATIONS ARE FOR THIS SOIL SAMPLE AND THIS SEASON ONLY. PLANT NUTRIENT RECOMMENDATIONS ARE FOR FERTILIZERS CONTAINING SPECIFIC RATIOS OF NITROGEN (N), PHOSPHATE (P205) AND POTASH (K20). AS AN EXAMPLE 5-10-10 CONTAINS 5% N, 10% P205, AND 10% K20. IF FERTILIZERS WITH THE RATIOS SHOWN ARE NOT AVAILABLE, CONTACT YOUR LOCAL GARDEN CENTER OR FERTILIZER SUPPLIER FOR THE APPROPRIATE SUBSTITUTION.

LABORATORY RESULTS:

6.2	2	0.0	0.07	8.9	75.0	23.9	0.2	37.0	62.7
SOIL pH	P lb/A	ACIDITY	K	Mg	Ca	CEC	K	Mg	Ca
		EXCHANGEABLE CATIONS (meq/100 g)					% SATURATION		

OTHER TESTS:

SOIL08 HOME GARDEN CROPS

COMMENTS

1. To be most effective, all recommended limestone and/or fertilizer should be incorporated 6 to 8 inches into the soil prior to planting. If plants or crop is established, apply recommended materials to the surface and water area well.

2. If 11 to 20 pounds of limestone are recommended, divide the amount by two and apply in two applications six months apart. If 21 or more pounds are recommended, divide the amount by three and make three applications at six month intervals.

3. If 3 or more pounds of MgSO4 (Epsom salts) are recommended, divide the amount by two and make separate applications at four month intervals. If an alternative magnesium source is used, apply an amount equal to the equivalent of 10.5% Mg in MgSO4; ONLY ONE APPLICATION should be needed.

4. When CEC is less than 15 (see laboratory results on front) add one inch of organic matter. If pH is greater than 7, use acid peat moss as the organic matter source.

5. Lime and fertilizer are recommended in pounds of material per each 100 square feet of area to be treated. Use the following conversions to convert from pounds per 100 square feet to other units or area sizes:

   pounds per 100 sq. ft. x 10 = pounds per 1000 sq. ft.
   pounds per 100 sq. ft. x 435 = pounds per acre

6. Amount of sulfer needed to lower soil pH to optimum level.
   (See front of report for soil pH and optimum pH)

FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)	FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)
8.0	7.5	0.50	7.0	6.5	0.75
	7.0	1.00		6.0	1.25
	6.5	2.00		5.5	2.50
	6.0	3.00			
	5.5	4.00			
7.5	7.0	0.75	6.5	6.0	1.00
	6.5	1.25		5.5	1.75
	6.0	2.50			
	5.5	3.50	6.0	5.5	1.50

Apply sulfur at the above rates for a loam soil. On heavier soil (silt loams) use one third more than the amount shown. On lighter soils (sandy loams) use one-half of the amounts shown. If aluminum or ferrous sulfate is used to lower pH, multiply the above amounts by 2.5. Follow the same suggestions as above for soil types. If 4 or more pounds are needed, divide the amount in half and make two applications six months apart.

- There is no reliable test for evaluating the amount of nitrogen (N) in soils that is available to crops over the growing season. The N recommended is based on the actual N that needs to be supplied annually to ensure optimum crop growth.

11/10/98	5686	103371	OUT OF STATE	00	336705	UNSPECIFIED
DATE	LAB NO.	SERIAL NO.	COUNTY	ACRES	FIELD	SOIL

AGRICULTURAL ANALYTICAL SERVICES LABORATORY
COLLEGE OF AGRICULTURAL SCIENCES
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802
(814 863-0841)

SOIL TEST REPORT FOR:
JOHN JOHNSON
2890 WOODBRIDGE AVE
EDISON NJ 08837

COPY SENT TO:
JENNIFER ROYCE
2890 WOODBRIDGE AVE
EDISON NJ 08837

SOIL NUTRIENT LEVELS:	LOW	MEDIUM	HIGH	EXCESSIVE
Soil pH	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
Phosphate (P_2O_5)	X			
Potash (K_2O)	XX			
Magnesium (MgO)	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
Calcium (CaO)	XXXXX			

RECOMMENDATIONS FOR: *UNSPECIFIED GARDEN CROP*

See Back For Comments

PH ADJUSTMENT LB/100 SQ.FT.		(MgSO4) EPSOM SALTS	*NONE*	1,2
CALCITIC LIMESTONE (0-3% MG)	*NONE*	(CaSO4) GYPSUM	*NONE*	3,5

MG AND CALCIUM ADJUSTMENT LB/100 SQ.FT.

PLANT NUTRIENT NEEDS: LBS/100 SQ.FT.

5-10-10		5-10-5		10-10-10	
2.5	+	*NONE*	+	*NONE*	7

0-46-0		0-0-60		UREA
1.0	+	*NONE*	+	*NONE*

MESSAGES:

- IF SOIL PH IN LABORATORY RESULTS IS GREATER THAN 6.5, USE SULFUR (SEE TABLE ON BACK) TO LOWER PH TO OPTIMUM LEVEL OF 6.5.
- THE ABOVE LIME AND FERTILIZER RECOMMENDATIONS ARE FOR THIS SOIL SAMPLE AND THIS SEASON ONLY. PLANT NUTRIENT RECOMMENDATIONS ARE FOR FERTILIZERS CONTAINING SPECIFIC RATIOS OF NITROGEN (N), PHOSPHATE (P2O5) AND POTASH (K2O). AS AN EXAMPLE 5-10-10 CONTAINS 5% N, 10% P2O5, AND 10% K2O. IF FERTILIZERS WITH THE RATIOS SHOWN ARE NOT AVAILABLE, CONTACT YOUR LOCAL GARDEN CENTER OR FERTILIZER SUPPLIER FOR THE APPROPRIATE SUBSTITUTION.

LABORATORY RESULTS:

8.0	2	0.0	0.16	9.9	75.0	25.1	0.6	39.4	59.7
SOIL pH	P lb/A	ACIDITY	K	Mg	Ca	CEC	K	Mg	Ca
		EXCHANGEABLE CATIONS (meq/100 g)					% SATURATION		

OTHER TESTS:

COMMENTS

1. To be most effective, all recommended limestone and/or fertilizer should be incorporated 6 to 8 inches into the soil prior to planting. If plants or crop is established, apply recommended materials to the surface and water area well.

2. If 11 to 20 pounds of limestone are recommended, divide the amount by two and apply in two applications six months apart. If 21 or more pounds are recommended, divide the amount by three and make three applications at six month intervals.

3. If 3 or more pounds of MgS04 (Epsom salts) are recommended, divide the amount by two and make separate applications at four month intervals. If an alternative magnesium source is used, apply an amount equal to the equivalent of 10.5% Mg in MgS04; ONLY ONE APPLICATION should be needed.

4. When CEC is less than 15 (see laboratory results on front) add one inch of organic matter. If pH is greater than 7, use acid peat moss as the organic matter source.

5. Lime and fertilizer are recommended in pounds of material per each 100 square feet of area to be treated. Use the following conversions to convert from pounds per 100 square feet to other units or area sizes:

   pounds per 100 sq. ft. x 10 = pounds per 1000 sq. ft.
   pounds per 100 sq. ft. x 435 = pounds per acre

6. Amount of sulfer needed to lower soil pH to optimum level.
   (See front of report for soil pH and optimum pH)

FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)	FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)
8.0	7.5	0.50	7.0	6.5	0.75
	7.0	1.00		6.0	1.25
	6.5	2.00		5.5	2.50
	6.0	3.00			
	5.5	4.00			
7.5	7.0	0.75	6.5	6.0	1.00
	6.5	1.25		5.5	1.75
	6.0	2.50			
	5.5	3.50	6.0	5.5	1.50

   Apply sulfur at the above rates for a loam soil. On heavier soil (silt loams) use one third more than the amount shown. On lighter soils (sandy loams) use one-half of the amounts shown. If aluminum or ferrous sulfate is used to lower pH, multiply the above amounts by 2.5. Follow the same suggestions as above for soil types. If 4 or more pounds are needed, divide the amount in half and make two applications six months apart.

7. There is no reliable test for evaluating the amount of nitrogen (N) in soils that is available to crops over the growing season. The N recommended is based on the actual N that needs to be supplied annually to ensure optimum crop growth.

DATE	LAB NO.	SERIAL NO.	COUNTY	ACRES	FIELD	SOIL
11/10/98	5687	103372	OUT OF STATE	00	336706	UNSPECIFIED

AGRICULTURAL ANALYTICAL SERVICES LABORATORY
COLLEGE OF AGRICULTURAL SCIENCES
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802
(814 863-0841)

SOIL TEST REPORT FOR:
JOHN JOHNSON
2890 WOODBRIDGE AVE
EDISON NJ 08837

COPY SENT TO:
JENNIFER ROYCE
2890 WOODBRIDGE AVE
EDISON NJ 08837

SOIL NUTRIENT LEVELS:

	LOW	MEDIUM	HIGH	EXCESSIVE
Soil pH	X	X	X	X
Phosphate (P_2O_5)	X			
Potash (K_2O)	X			
Magnesium (MgO)	X	X		
Calcium (CaO)	X	X	X	

RECOMMENDATIONS FOR: *UNSPECIFIED GARDEN CROP*

See Back For Comments

PH ADJUSTMENT LB/100 SQ.FT.

CALCITIC LIMESTONE (0-3% MG): **NONE**

MG AND CALCIUM ADJUSTMENT LB/100 SQ.FT.

(MgSO4) EPSOM SALTS: **NONE** — 1,2

(CaSO4) GYPSUM: **NONE** — 3,5

PLANT NUTRIENT NEEDS: LBS/100 SQ.FT. — 7

5-10-10		5-10-5		10-10-10
NONE	+	2.5	+	NONE

0-46-0		0-0-60		UREA
0.25	+	NONE	+	NONE

MESSAGES:

- IF SOIL PH IN LABORATORY RESULTS IS GREATER THAN 6.5, USE SULFUR (SEE TABLE ON BACK) TO LOWER PH TO OPTIMUM LEVEL OF 6.5.
- THE ABOVE LIME AND FERTILIZER RECOMMENDATIONS ARE FOR THIS SOIL SAMPLE AND THIS SEASON ONLY. PLANT NUTRIENT RECOMMENDATIONS ARE FOR FERTILIZERS CONTAINING SPECIFIC RATIOS OF NITROGEN (N), PHOSPHATE (P205) AND POTASH (K20). AS AN EXAMPLE 5-10-10 CONTAINS 5% N, 10% P205, AND 10% K20. IF FERTILIZERS WITH THE RATIOS SHOWN ARE NOT AVAILABLE, CONTACT YOUR LOCAL GARDEN CENTER OR FERTILIZER SUPPLIER FOR THE APPROPRIATE SUBSTITUTION.

LABORATORY RESULTS:

SOIL pH	P lb/A	ACIDITY	K	Mg	Ca	CEC	K	Mg	Ca
		EXCHANGEABLE CATIONS (meq/100 g)					% SATURATION		
6.4	101	0.0	0.49	2.1	27.5	17.6	2.7	11.7	85.2

OTHER TESTS:

COMMENTS

1. To be most effective, all recommended limestone and/or fertilizer should be incorporated 6 to 8 inches into the soil prior to planting. If plants or crop is established, apply recommended materials to the surface and water area well.

2. If 11 to 20 pounds of limestone are recommended, divide the amount by two and apply in two applications six months apart. If 21 or more pounds are recommended, divide the amount by three and make three applications at six month intervals.

3. If 3 or more pounds of MgS04 (Epsom salts) are recommended, divide the amount by two and make separate applications at four month intervals. If an alternative magnesium source is used, apply an amount equal to the equivalent of 10.5% Mg in MgS04; ONLY ONE APPLICATION should be needed.

4. When CEC is less than 15 (see laboratory results on front) add one inch of organic matter. If pH is greater than 7, use acid peat moss as the organic matter source.

5. Lime and fertilizer are recommended in pounds of material per each 100 square feet of area to be treated. Use the following conversions to convert from pounds per 100 square feet to other units or area sizes:

   pounds per 100 sq. ft. x 10 = pounds per 1000 sq. ft.
   pounds per 100 sq. ft. x 435 = pounds per acre

6. Amount of sulfer needed to lower soil pH to optimum level.
   (See front of report for soil pH and optimum pH)

FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)	FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)
8.0	7.5	0.50	7.0	6.5	0.75
	7.0	1.00		6.0	1.25
	6.5	2.00		5.5	2.50
	6.0	3.00			
	5.5	4.00			
7.5	7.0	0.75	6.5	6.0	1.00
	6.5	1.25		5.5	1.75
	6.0	2.50			
	5.5	3.50	6.0	5.5	1.50

   Apply sulfur at the above rates for a loam soil. On heavier soil (silt loams) use one third more than the amount shown. On lighter soils (sandy loams) use one-half of the amounts shown. If aluminum or ferrous sulfate is used to lower pH, multiply the above amounts by 2.5. Follow the same suggestions as above for soil types. If 4 or more pounds are needed, divide the amount in half and make two applications six months apart.

7. There is no reliable test for evaluating the amount of nitrogen (N) in soils that is available to crops over the growing season. The N recommended is based on the actual N that needs to be supplied annually to ensure optimum crop growth.

11/10/98	5688	103373	OUT OF STATE	00	336707	UNSPECIFIED
DATE	LAB NO.	SERIAL NO.	COUNTY	ACRES	FIELD	SOIL

AGRICULTURAL ANALYTICAL SERVICES LABORATORY
COLLEGE OF AGRICULTURAL SCIENCES
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802
(814 863-0841)

SOIL TEST REPORT FOR:
JOHN JOHNSON
2890 WOODBRIDGE AVE
EDISON NJ 08837

COPY SENT TO:
JENNIFER ROYCE
2890 WOODBRIDGE AVE
EDISON NJ 08837

SOIL NUTRIENT LEVELS:

		LOW / MEDIUM / HIGH / EXCESSIVE
Soil pH		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Phosphate	(P_2O_5)	X
Potash	(K_2O)	XXX
Magnesium	(MgO)	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Calcium	(CaO)	XXXXXXXXXXXXXXXXXXXXXXX

RECOMMENDATIONS FOR: *UNSPECIFIED GARDEN CROP*

See Back For Comments

MG AND CALCIUM ADJUSTMENT LB/100 SQ.FT.

		See Back For Comments
$(MgSO_4)$ EPSOM SALTS	NONE	1,2
$(CaSO_4)$ GYPSUM	NONE	3,5

PH ADJUSTMENT LB/100 SQ.FT.

CALCITIC LIMESTONE (0-3% MG)	NONE

PLANT NUTRIENT NEEDS: LBS/100 SQ.FT. (See Back For Comments: 7)

5-10-10		5-10-5		10-10-10
2.5	+	NONE	+	NONE
0-46-0		**0-0-60**		**UREA**
1.0	+	NONE	+	NONE

MESSAGES:

- IF SOIL PH IN LABORATORY RESULTS IS GREATER THAN 6.5, USE SULFUR (SEE TABLE ON BACK) TO LOWER PH TO OPTIMUM LEVEL OF 6.5.
- THE ABOVE LIME AND FERTILIZER RECOMMENDATIONS ARE FOR THIS SOIL SAMPLE AND THIS SEASON ONLY. PLANT NUTRIENT RECOMMENDATIONS ARE FOR FERTILIZERS CONTAINING SPECIFIC RATIOS OF NITROGEN (N), PHOSPHATE (P205) AND POTASH (K20). AS AN EXAMPLE 5-10-10 CONTAINS 5% N, 10% P205, AND 10% K20. IF FERTILIZERS WITH THE RATIOS SHOWN ARE NOT AVAILABLE, CONTACT YOUR LOCAL GARDEN CENTER OR FERTILIZER SUPPLIER FOR THE APPROPRIATE SUBSTITUTION.

LABORATORY RESULTS:

8.5	13	0.0	0.19	4.6	75.0	19.8	0.9	23.4	75.7
SOIL pH	P lb/A	ACIDITY	K	Mg	Ca	CEC	K	Mg	Ca
		EXCHANGEABLE CATIONS (meq/100 g)					% SATURATION		

OTHER TESTS:

COMMENTS

1. To be most effective, all recommended limestone and/or fertilizer should be incorporated 6 to 8 inches into the soil prior to planting. If plants or crop is established, apply recommended materials to the surface and water area well.

2. If 11 to 20 pounds of limestone are recommended, divide the amount by two and apply in two applications six months apart. If 21 or more pounds are recommended, divide the amount by three and make three applications at six month intervals.

3. If 3 or more pounds of MgS04 (Epsom salts) are recommended, divide the amount by two and make separate applications at four month intervals. If an alternative magnesium source is used, apply an amount equal to the equivalent of 10.5% Mg in MgS04; ONLY ONE APPLICATION should be needed.

4. When CEC is less than 15 (see laboratory results on front) add one inch of organic matter. If pH is greater than 7, use acid peat moss as the organic matter source.

5. Lime and fertilizer are recommended in pounds of material per each 100 square feet of area to be treated. Use the following conversions to convert from pounds per 100 square feet to other units or area sizes:

   pounds per 100 sq. ft. x 10 = pounds per 1000 sq. ft.
   pounds per 100 sq. ft. x 435 = pounds per acre

6. Amount of sulfer needed to lower soil pH to optimum level.
   (See front of report for soil pH and optimum pH)

FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)	FROM CURRENT SOIL PH	TO OPTIUM SOIL PH	SULFUR (lb/100 sq ft)
8.0	7.5	0.50	7.0	6.5	0.75
	7.0	1.00		6.0	1.25
	6.5	2.00		5.5	2.50
	6.0	3.00			
	5.5	4.00			
7.5	7.0	0.75	6.5	6.0	1.00
	6.5	1.25		5.5	1.75
	6.0	2.50			
	5.5	3.50	6.0	5.5	1.50

   Apply sulfur at the above rates for a loam soil. On heavier soil (silt loams) use one third more than the amount shown. On lighter soils (sandy loams) use one-half of the amounts shown. If aluminum or ferrous sulfate is used to lower pH, multiply the above amounts by 2.5. Follow the same suggestions as above for soil types. If 4 or more pounds are needed, divide the amount in half and make two applications six months apart.

7. There is no reliable test for evaluating the amount of nitrogen (N) in soils that is available to crops over the growing season. The N recommended is based on the actual N that needs to be supplied annually to ensure optimum crop growth.

USEPA-ERT

CHAIN OF CUSTODY RECORD

COC # 3367-0002

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200
WO#: 03347-143-001-5382-01
EPA Contract 68-C4-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:
Lab: Penn State
Contact: Ann Wolf

LAB #	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
5682	A	3367-001	Location 1	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
5683	A	3367-002	Location 2	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
5684	A	3367-003	Location 3	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
5685	A	3367-004	Location 4	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
5686	A	3367-005	Location 5	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
5687	A	3367-006	Location 6	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
5688	A	3367-007	Fill	Soil	11/2/98	8 oz glass/4 C	Agronomics II		
5689									

REFERENCE COC:

Special Instructions:
Agronomics II = Available Macronutrients Ca, Mg, K, pH, CEC, Available Micronutrients Mn, Zn, Cu, Soluable Salts, TOC, Percent Moisture

qc: AM

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/98	Paul Gamm Stake	11/4/98	10:00						

USEPA ER1

CHAIN OF CUST Y RECORD

COC # 3367-0005

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200
WO#: 03947-143-001 3367-01
EPA Contract 68-04-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:
Lab: Gelson
Contact: Ann Weaver

L46825-3 MS
L46825-4 MSD

Lab #	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
L46825-1	D	3367-001	Location 1	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B		
	D	3367-002	Location 2	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B	yes	
	D	3367-003	Location 3	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B		
L46825-5	D	3367-004	Location 4	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B		
L46825-6	D	3367-005	Location 5	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B		
	D	3367-006	Location 6	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B		
L46825-7	D	3367-007	Fill	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B		
L46825-8	D	3367-008	Field Blank	Soil	11/2/05	8 oz glass/4 C	TAL metals + Mo, B		
L46825-9									
L46825-10									

Special Instructions:
QC: MS

REFERENCE COC:

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/05	T. L	11/4/05	1145						

[redacted] ACCOUNT NUI [redacted]: 00020

A & L GREAT LAKES LABORATORIES, INC.

3505 Conestoga Drive • Fort Wayne, Indiana 46808-4413 • Phone (219)483-4759 • FAX (219)483-5274

• R310-001 ADDITION
12/1/98

REPORT OF ANALYSIS

TO: A & L EASTERN AGRIC LABS
7621 WHITEPINE ROAD
RICHMOND, VA 23237-2214

ROY F WESTON INC
BLDG 209 ANNEX (BAY F)
2890 WOODBRIDGE AVE.
EDISON NJ 08837

DATE RECEIVED: 11/10/98
DATE REPORTED: 11/24/98
PAGE: 1

RE: WO#03347-143-001-3367-01 EPA CONTRACT 66-C4-0022
NAPLES TRUCK STOP
RE: 45680/45686

LAB NO.	SAMPLE ID	ANALYSIS	RESULT	UNIT	METHOD
40679	45680 (3367-001)	Water Holding Capacity @ 1/3 Bar	15.21	%	MSA Part 1 (1965) pp 273-278
		Water Holding Capacity @ 15 Bar	8.29	%	MSA Part 1 (1965) pp 273-278
40680	45681 (3367-002)	Water Holding Capacity @ 1/3 Bar	15.97	%	MSA Part 1 (1965) pp 273-278
		Water Holding Capacity @ 15 Bar	8.18	%	MSA Part 1 (1965) pp 273-278
40681	45682 (3367-003)	Water Holding Capacity @ 1/3 Bar	17.29	%	MSA Part 1 (1965) pp 273-278
		Water Holding Capacity @ 15 Bar	9.04	%	MSA Part 1 (1965) pp 273-278
40682	45683 (3367-004)	Water Holding Capacity @ 1/3 Bar	15.85	%	MSA Part 1 (1965) pp 273-278
		Water Holding Capacity @ 15 Bar	8.33	%	MSA Part 1 (1965) pp 273-278
40683	45684 (3367-005)	Water Holding Capacity @ 1/3 Bar	16.60	%	MSA Part 1 (1965) pp 273-278
		Water Holding Capacity @ 15 Bar	8.87	%	MSA Part 1 (1965) pp 273-278
40684	45685 (3367-006)	Water Holding Capacity @ 1/3 Bar	8.86	%	MSA Part 1 (1965) pp 273-278
		Water Holding Capacity @ 15 Bar	4.05	%	MSA Part 1 (1965) pp 273-278

REPORT NUMBER: F98314-459
ACCOUNT NUMBER: 00020

A & L GREAT LAKES LABORATORIES, INC.

3505 Conestoga Drive • Fort Wayne, Indiana 46808-4413 • Phone (219)483-4759 • FAX (219)483-5274

REPORT OF ANALYSIS

TO: A & L EASTERN AGRIC LABS
7621 WHITEPINE ROAD
RICHMOND, VA 23237-2214

DATE RECEIVED: 11/10/98
DATE REPORTED: 11/24/98

RE: 45680/45686

LAB NO.	SAMPLE ID	ANALYSIS	RESULT	UNIT	METHOD
40685	45686 (3367-007)	Water Holding Capacity @ 1/3 Bar	7.00	%	MSA Part 1 (1965) pp 273-278
		Water Holding Capacity @ 15 Bar	3.47	%	MSA Part 1 (1965) pp 273-278

USEPA Sh.

CHAIN OF CUSTODY RECORD

COC # 3367-0001

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200
WO#: 03347-143-001-3367-01
EPA Contract 68-C4-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:003346
Lab: A & L Eastern Agricultural Lab
Contact: Paul Chu

Lab #	Tag	Sample #	Location	# of containers	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
	F	3367-001	Location 1	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-002	Location 2	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-003	Location 3	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-004	Location 4	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-005	Location 5	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-006	Location 6	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		
	F	3367-007	Fill	2	Soil	11/2/98	32 oz glass/4 C	Agronomics I		

Special Instructions:
Agronomics I = Ammonia, Nitrate, Nitrite, TKN, Available P, Sulfate, Chloride, Available Micronutrients B, Grain Size, Specific Gravity, Lime Requirements, Water Holding Capacity
QC: RH
← pH = 7

REFERENCE COC:

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/98									

APPENDIX C
Final Microbiology Results
Naples Truck Stop Site
Final Report
April 1999

Background Information

Soil samples were analyzed using the experimental protocol outlined below (see page 2). Nitrogen analysis included measurement of NH_4-N, NO_3-N, DON and MBN parameters. Ammonium (NH_4-N) and nitrate (NO_3-N) are forms of nitrogen that are considered to be readily-available for uptake by plants. In natural systems, ammonium and nitrate concentrations are regulated by microbial activity. Some types of soil bacteria and fungi, commonly referred to as heterotrophic or saprotrophic microorganisms, derive much of their energy from the decomposition of organic matter (e.g. plant and animal residues). Nitrogen in excess of their metabolic requirements is released as ammonium. A group of soil bacteria, known as ammonium oxidizers, are capable of using ammonium as an energy source and in the process convert NH_4-N to NO_3-N. Mineral N is the total concentration of NH_4-N and NO_3-N in soil, and is an indication of the amount of nitrogen in the soil that can be easily taken up by plants. Dissolved organic nitrogen (DON) includes amino acids, proteins, and other organic nitrogen-containing compounds that exist in the soil solution or are very loosely bound to the soil matrix. These materials may be available for decomposition by microorganisms and thus contribute to the mineral N pool, or may become physically and/or chemically stabilized in the soil organic nitrogen pool. Microbial biomass nitrogen (MBN) is the nitrogen in cells of soil microorganisms and is determined by fumigating soil with chloroform, which causes microbial cells to lyse, releasing nitrogen into the soil where it can be extracted and measured.

Carbon analysis in the experiment included DOC, MBC and CO_2-C analysis. Dissolved organic carbon (DOC) includes carbon in sugars, amino acids, proteins, organic acids and other organic carbon-containing compounds that exist in the soil solution or are bound loosely to clays and soil organic matter. Similarly to DON, dissolved organic carbon compounds may be an energy source for microorganisms or become stabilized in soil organic matter. Microbial biomass carbon (MBC) is a measure of the carbon in cells of soil microorganisms and is determined in the same manner as MBN. Microbial activity, or respiration, is the quantity of CO_2-C evolved from soil during soil. Microbial biomass carbon and nitrogen analysis allow for a more or less quantitative measurement of C and N in microbial cells; however, these analysis do not

provide information on the proportion of the microbial communities that are actively growing. Varying proportions of soil bacteria and fungi are actively growing at any given time, depending on climatic and soil conditions. CO_2-C respiration measures directly the proportion of actively growing organisms in the soil microbial community.

The experiment included soil biochemical analysis, namely the FDA, dehydrogenase and b-glucosidase assays. The fluorescein diacetate assay (FDA) measures the number of active fungal cells in soil based on the hydrolysis of fluorescein diacetate to fluorescein by esterase enzymes. Dehydrogenase is an enzyme found in the cells of microorganisms and is important in the oxidation of organic carbon compounds. The dehydrogenase activity of soils is a measure of the ability of active bacterial cells to break down organic matter, and is often well correlated to CO_2-C respiration, although this may vary depending on the site sampled. The b-glucosidase assay measures the ability of microorganisms, primarily fungi, to hydrolyze glycosides (components of cellulose and lignin) to simple sugars. The hydrolysis products of b-glucosidase enzymes are believed to be an important energy source for soil microorganisms.

The C, N and biochemical parameters were measured on soil samples collected from the field and after incubation (42 days). The purpose of incubating soils was to determine the potential of the microorganisms in soils from the Naples site to mineralize C and N and determine their biochemical activity under controlled conditions that are known to be conducive to microbial activity (e.g. temperature = 25°C, soil moisture content = 80%).

Procedure for Soil Nitrogen and Carbon Analysis

Field-moist soil samples were sieved through a 2 mm mesh sieve and analyzed to determine mineral N (NH_4-N and NO_3-N), dissolved organic nitrogen and carbon (DON and DOC), and microbial biomass nitrogen and carbon (MBN and MBC). A subsample of the sieved soil was oven-dried at 60°C for 48 hours to determine gravimetric soil moisture content.

Mineral N (NH_4-N and NO_3-N) and dissolved organic nitrogen and carbon (DON and DOC) were determined by extracting 20 g of sieved, field-moist soil with 80 ml of 0.5 M K_2SO_4 solution (1:4 soil:extractant). Samples were shaken on a rotary shaker at

150 rpm for 45 minutes, filtered through Whatman 42 filter paper and stored at 4°C until analysis.

NH_4-N and NO_3-N concentrations in soil extracts were determined colorimetrically using the phenate and ccadmium reduction-diazotization methods with a Technicon II flow-injection autoanalyzer. DON was determined by digesting 2 ml of the original soil extract and 2 ml of 0.5 M K_2SO_4 solution with 3 ml of an alkaline persulfate solution (6.24 g of boric acid, 10.4 g of potassium persulfate and 20 ml of 3.75 N NaOH in 200 ml of deionized water) in an autoclave for 30 minutes. The DON concentration was calculated as the difference between the NO_3-N concentration in the persulfate digest of the soil extract and the mineral N (NH_4-N + NO_3-N) concentration in the initial soil extract. The DOC concentration in soil extracts was measured by wet combustion with a Dohrman DC-190 carbon analyzer.

Microbial biomass nitrogen and carbon (MBN and MBC) were be determined using the chloroform fumigation-direct extraction method. Briefly, 20 g of sieved, field-moist soil was weighed into a 125 ml Erlenmeyer flask and placed in a vacuum desiccator lined with moist paper towels. A beaker containing 50 ml of ethanol-free chloroform and antibumping granules was added, and the desiccator was evacuated until the chloroform boiled vigorously. The procedure was repeated three times to facilitate the distribution of chloroform through the soil. The desiccator was evacuated a fourth time until the chloroform boiled vigorously for 2 minutes, and the valve on the desiccator was closed.

Soil samples were fumigated once a day for five days, and then extracted with 80 ml of 0.5 M K_2SO_4 solution (1:4 soil:extractant). Samples were shaken on a rotary shaker at 150 rpm for 45 minutes and filtered through Whatman 42 filter paper. MBN was determined by digesting 2 ml of the fumigated soil extract and 2 ml of 0.5 M K_2SO_4 with 3 ml of an alkaline persulfate solution in an autoclave for 30 minutes. The MBN concentration was calculated as the difference between the total extractable NO_3-N after fumigation and the total extractable NO_3-N before fumigation. The MBC concentration was calculated as the difference between the extractable C content in soil extracts after fumigation and the extractable C content before fumigation. Extractable C in soil

extracts after fumigation was measured by wet combustion with a Dohrman DC-190 carbon analyzer.

Net Nitrogen and Carbon Mineralization during Laboratory Incubation

Net carbon and nitrogen mineralization in soil samples was determined by aerobically incubating soils in the laboratory at 25°C for 42 days. Two 50 ml beakers containing twenty grams of field-moist soil, moistened to at least 29% gravimetric soil moisture content, and a scintillation vial containing 10 ml of water to prevent soil desiccation were placed into a one quart mason jar. The jar was capped with a gas tight lid containing a rubber septum for gas sampling.

Microbial respiration (CO_2-C production) was measured every 7 days using a gas tight syringe. After mixing the gas in the headspace of the mason jar, a 5 ml sample was taken and injected into a 3 ml vacutainer. Then, the lids were removed for 15 minutes to aerate the soil, and a second gas sample was taken after the mason jars are resealed to determine the new baseline amounts of respiratory gases in the headspace. The CO_2-C concentration was determined using a Hach Carle Series 100 infrared gas analyzer.

After 42 days, the soils were removed from the mason jars and analyzed to determine mineral N (NH_4-N and NO_3-N), dissolved organic nitrogen and carbon (DON and DOC), and microbial biomass nitrogen and carbon (MBN and MBC) using the procedures outlined above. Net nitrogen mineralization was the difference between the initial (day 0) and final (day 42) concentrations of mineral nitrogen (NH_4-N + NO_3-N). Net changes in DON, DOC, MBN and MBC were the differences between the initial (day 0) and final (day 42) concentrations of extractable soil nitrogen and carbon pools. Mean CO_2-C production was the mean concentration of CO_2-C produced from microbial respiration assessed weekly during soil incubation.

Fungal Community Analysis using Fluorescein Diacetate Method

Active cells of fungal mycelia contain esterase enzymes that hydrolyze the nonfluorescent ester fluorescein diacetate (FDA) to produce fluorescein that can be detected by epifluroescence microscopy. Twenty grams of sieved, field moist soil was suspended in 95 ml of 60 mM phosphate buffer adjusted to soil pH and shaken at 225 rpm for 15 minutes. One ml of the soil suspension was diluted with 4 ml of phosphate buffer (50-fold dilution), and 1 ml of the 50-fold soil dilution was incubated with 1 ml of

sterilized FDA (20 mg L^{-1}) for 3 minutes at room temperature. Then, 1 ml of a water agar solution (1.5% w/v in phosphate buffer, pH 7.6) was added and 0.1 ml of the suspension is transferred to a microscope slide. The slides were examined under a light microscope at 400 to 1000X to determine the proportion of FDA-hydrolyzing mycelia, and the total mycelial length was determined using phase contrast optics.

Enzyme Activity using Dehydrogenase and b-Glucosidase Assays

Active bacterial cells contain dehydrogenase enzymes, which are involved in the oxidation of soil organic matter and transfer of hydrogen ions from organic compounds to electron acceptors. Hydrolysis of the substrate 2,3,5,-triphenyltetrazolium chloride (TTC) by dehydrogenase leads to the formation of triphenyl formazan (TPF). One gram of sieved, field moist soil was mixed with 0.1 g of $CaCO_3$ in a test tube. Five replicate tubes of soil were prepared for each soil sample obtained from the field. Three tubes received 2 ml of the TTC solution (0.5% TTC in 0.5 M Tris buffer) and 1 ml of 0.5 M Tris buffer, while the other two tubes received only 1 ml of 0.5 M Tris buffer and served as the control. All tubes were incubated at 37°C for six hours, and placed in a freezer at -10°C to stop the reaction. The enzyme-cleaved product TPF was extracted with 10 ml of methanol, filtered through Whatman 42 filter paper, and analyzed colorimetrically at 480 nm using Titertek Multiscan MCC/340 automated microplate reader.

Glucosidases hydrolyse glycosides (components of cellulose and lignin) to simple sugars that may be an important energy source for soil microorganisms. The most common soil glucosidase is b-glucosidase, a component of most fungal cells. b-glucosidase activity was assayed by mixing 1 g of sieved, field-moist soil with 0.25 ml of toluene, 4 ml of modified universal buffer (pH 6.0) and 1 ml of 0.05 M p-nitrophenyl-b-D-glucoside (PNG) solution. Five replicate tubes were prepared for each soil sample obtained from the field. Three tubes received the PNG solution while the other two tubes served as a control. All tubes were placed in an incubator at 37°C. After one hour, 1 ml of 0.5 M $CaCl_2$ and 4 ml of 0.1M THAM buffer (pH 12) were added. The tubes were mixed, filtered through Whatman 42 filter paper, and the quantity of p-nitrophenol hydrolyzed by b-glucosidase was determined colorimetrically at 420 nm using Titertek Multiscan MCC/340 automated microplate reader.

References for Analytical Procedures

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Subler S.E., Baranski C.M, Edwards C.A. (1997) Earthworm additions increased short-term nitrogen availability and leaching in two grain-crop agroecosystems. Soil Biology and Biochemistry 29:413-421.

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Interpretation of Results for Naples Truck Stop

Nitrogen Analysis

Initial concentrations (day 0) of NH_4-N were relatively low at all sites sampled, ranging from about 0.2 to 0.8 mg NH_4 g^{-1} soil. The net change in NH_4-N concentrations during laboratory incubation was relatively small. There was a net decline in the NH_4-N concentration in soils from sites 1 and 7, and a net increase in NH_4-N at all other sites.

Nitrate (NO_3-N) concentrations varied considerably between sites, and increased substantially after laboratory incubation of soils from sites 3, 6 and 7. Dissolved organic nitrogen (DON) concentrations declined, and microbial biomass nitrogen (MBN) concentrations tended to increase or remain stable during laboratory incubation.

It appears that for soils from the sites examined, dissolved organic nitrogen may have contributed to microbial growth and accumulation of N in microbial biomass. Other sources of N for microbial growth were likely N from the mineral N pools, which may account for the small net changes in NH_4-N and NO_3-N concentrations during laboratory incubation. It appears that much of nitrogen released from organic matter (NH_4-N) or converted to NO_3-N by ammonium oxidizers was immobilized (i.e. excess mineral N was quickly incorporated into microbial biomass).

Carbon Analysis

Dissolved organic carbon concentrations did not change dramatically during soil incubation. In most soils, DOC concentrations increased slightly after 42 days, although in sites 2 and 6, DOC concentrations decreased slightly. The microbial biomass C concentrations increased in all soils after incubation, suggesting microbial growth and accumulation of carbon in microbial cells.

Uptake of carbon and nitrogen by microorganisms varied among sites. In sites 1, 2, 3 and 6, both C and N concentrations in microbial biomass increased greatly during soil incubation. However, in sites 4, 5 and 7, MBC increased while MBN concentrations remained approximately the same or declined slightly. These results suggest that microbial growth in sites 1, 2, 3 and 6 was limited by the availability of carbon and nitrogen sources, while microorganisms in sites 4, 5 and 7 lacked primarily carbon for growth. In uncontaminated systems, microbial growth is typically limited by carbon availability.

Soil respiration was determined by taking CO_2 measurements from incubating soils on a weekly basis. There was considerable variability in weekly CO_2-C production within replicates from the same site, which suggests periods of considerable microbial growth and activity followed by periods of much less growth and activity. Cumulative CO_2-C production, which is a measure of the total soil respiration over a 42 day incubation, was presented. Soil respiration was lowest in site 1 and greatest in site 6. It

appeared that despite the substantial accumulation of C and N in microbial biomass of soils from sites 1, 2, and 3, microbial growth and respiration was reduced compared to soils from sites 4 to 7. Respiration was greatest in soils from site 6, which indicates the potential for a large proportion of the microbial community in this soil to be active when temperature and moisture conditions are optimal.

Fungal and Enzyme Analysis

Active fungal length and biomass was determined in soil samples from the study site prior to incubation and at the end of a 42 day laboratory incubation. Initially, active fungi were detected only in site 6; however, after laboratory incubation, fungal growth was detected in soils from sites 2, 5, 6 and 7. The biomass and length of active fungi was greatest in soil from site 6 at all sampling times. The increase in active fungi in soils from sites 2, 5, 6 and 7 suggests the potential for fungal growth and activity when temperature and moisture conditions are optimal.

Soil enzyme analysis was conducted to determine the activity of dehydrogenase and b-glucosidase enzymes in soil samples collected for this study. Enzyme activity is determined by adding a substrate to soil, providing appropriate conditions for substrate hydrolysis and measuring the product of the reaction. Soil enzyme activity is expressed as the quantity of enzyme-cleaved product generated per gram of soil. Active bacterial cells contain dehydrogenase enzymes, which are involved in the oxidation of soil organic matter. The dehydrogenase activity of soil samples in this study ranged from 0.93 – 3.95 mg TTF g^{-1} soil at day 0, and increased to 1.67 to 8.54 mg TTF g^{-1} soil after 42 days of laboratory incubation. Dehydrogenase activity increased in soil from all sites except site 4, where dehydrogenase activity decreased slightly during laboratory incubation. Dehydrogenase activity after laboratory incubation was greatest in soil from site 6. The increase in dehydrogenase activity was likely due to bacterial growth under laboratory conditions, and suggests the potential for rapid bacterial growth in soils from these sites under optimal conditions.

The enzyme b-glucosidase is a component of most fungal cells, and provides information on the presence of enzymes capable of hydrolysing glycosides (components of cellulose and lignin). The initial b-glucosidase activity of soils from the study site was between 0.33 – 24.5 mg PNP g^{-1} soil. Soil from site 6 had the greatest initial b-

glucosidase activity, while the lowest initial enzyme activity was observed in sites 3 and 4. Laboratory incubation of soils from the study site resulted in an increase in b-glucosidase activity in all samples, and enzyme activity was between 30-90% greater after laboratory incubation. The increase in b-glucosidase activity was likely due to fungal growth, and suggests that laboratory conditions were conducive to fungal proliferation in soils from the study site. However, when the b-glucosidase and dehydrogenase activities in soil from site 6 are compared with soils from the other sites, it was noted that, after laboratory incubation, b-glucosidase activity in soil from site 6 was four to twelve times greater than b-glucosidase activity in soil from the other sites. Dehydrogenase activity in soil from site 6 was not more than five-fold greater than dehydrogenase activity in soil from other sites. These results seem to indicate that bacterial communities in soils from all sites are capable of more rapid recovery to perturbation than fungal communities.

Overall, this study demonstrates that soils with very low initial microbial biomass have the capacity to reestablish active microbial communities within a relatively short time (42 days) under optimal conditions. Mineral nitrogen concentrations were low throughout the study, which suggests that much of the available nitrogen was immobilized in microbial biomass. While these soils have the potential to provide sufficient nitrogen for native vegetation, they are likely not well suited for production agriculture.

Soil Sample Analysis Sheet

Name: Jen Royce
Site: Naples Truck Stop
Sampling Date: November, 1998
Procedure: K_2SO_4-extractable DOC and MBC & CO_2-C analysis

Site #	Replicate	Incubation Time (d)	DOC $\mu g\ g^{-1}$ soil	MBC $\mu g\ g^{-1}$ soil	CO_2-C production ($\mu g\ g^{-1}$ soil) Day 7	Day 14	Day 21	Day 28	Day 35	Day 42	Total CO_2-C $\mu g\ g^{-1}$ soil
1	1	0	83.01	32.76							
1	2	0									
1	1	42	154.30	283.21	9.55	5.55	5.48	1.25	5.55	1.82	29.20
1	2	42			6.72	9.32	3.45	3.35	12.50	2.21	37.53
2	1	0	149.96	53.50							
2	2	0									
2	1	42	145.59	214.33	6.03	9.61	3.41	3.66	5.96	1.74	30.41
2	2	42			5.49	7.73	3.86	2.10	19.83	1.73	40.74
3	1	0	95.02	20.38							
3	2	0									
3	1	42	123.40	216.73	7.57	11.01	4.72	4.70	2.73	1.95	32.68
3	2	42			5.91	37.47	.	2.70	17.78	0.84	64.70
4	1	0	113.30	6.69							
4	2	0									
4	1	42	198.07	232.43	10.96	6.72	2.32	1.43	6.67	2.58	30.69
4	2	42			2.77	50.14	2.32	1.53	23.50	4.39	84.64
5	1	0	93.24	18.29							
5	2	0									
5	1	42	216.53	416.93	4.37	39.46	3.18	0.77	16.95	6.39	71.12
5	2	42			7.57	47.34	4.17	2.11	15.38	1.91	78.46
6	1	0	170.25	361.24							
6	2	0									
6	1	42	153.50	687.76	43.64	123.40	36.86	32.44	94.78	60.43	391.54
6	2	42			43.33	45.99	25.79	17.84	125.82	53.31	312.08
7	1	0	79.35	268.25							
7	2	0									
7	1	42	90.15	821.58	7.38	35.44	5.09	3.75	40.19	7.69	99.53
7	2	42			3.23	33.62	4.26	3.06	63.10	2.85	110.12

Soil Sample Analysis Sheet

Name: Jen Royce
Site: Naples Truck Stop
Sampling Date: November, 1998
Procedure: K_2SO_4-extractable NH_4-N, NO_3-N, DON and MBN

Site #	Replicate	Incubation Time (d)	NH_4-N $\mu g\ g^{-1}$ soil	NO_3-N $\mu g\ g^{-1}$ soil	DON $\mu g\ g^{-1}$ soil	MBN $\mu g\ g^{-1}$ soil
1	1	0	0.55	2.60	2.17	0.00
1	2	0	0.89	2.61	2.30	0.00
1	1	42	0.20	3.16	0.00	3.97
1	2	42	0.33	2.56	0.00	3.98
2	1	0	0.63	10.01	1.47	0.00
2	2	0	0.83	10.23	0.27	0.00
2	1	42	0.82	9.72	0.00	3.16
2	2	42	0.68	9.74	0.00	4.13
3	1	0	0.43	0.44	1.04	0.37
3	2	0	0.21	0.00	1.75	0.00
3	1	42	0.66	1.59	0.00	1.44
3	2	42	0.70	1.72	0.00	0.33
4	1	0	0.39	9.58	0.00	19.10
4	2	0	0.81	9.63	0.00	17.64
4	1	42	1.05	8.72	0.00	13.77
4	2	42	1.05	8.68	0.00	12.18
5	1	0	0.24	9.90	0.00	20.27
5	2	0	0.50	10.10	0.68	19.82
5	1	42	1.05	9.68	0.00	16.12
5	2	42	0.52	10.20	0.04	14.64
6	1	0	0.80	0.97	1.18	4.90
6	2	0	0.25	0.00	1.88	2.39
6	1	42	1.79	20.83	0.00	23.40
6	2	42	2.59	3.50	0.00	29.81
7	1	0	0.20	0.55	0.62	16.38
7	2	0	0.19	0.26	1.80	10.24
7	1	42	0.06	2.63	0.00	18.22
7	2	42	0.15	2.70	0.00	15.58

Soil Sample Analysis Sheet

Name: Jen Royce
Site: Naples Truck Stop
Sampling Date: November, 1998
Procedure: Fluorescein Diacetate Fungal Analysis

Site #	Replicate #	Incubation Time (d)	Soil wt (g)	Soil dry wt (g)	Active Fungal Length (cm g^{-1} soil)	Active Fungal Biomass (µg g^{-1} soil)
1	1	0	11.93	0.86	0	0
1	1	42	12.46	0.76	0	0
2	1	0	11.91	0.89	0	0
2	1	42	13.93	0.74	37.64	0.48
3	1	0	12.89	0.92	0	0
3	1	42	12.22	0.72	0	0
4	1	0	13.56	0.88	0	0
4	1	42	12.44	0.75	0	0
5	1	0	13.17	0.9	0	0
5	1	42	15.21	0.78	25.08	0.18
6	1	0	16.04	0.93	41.83	0.84
6	1	42	12.35	0.8	553.03	7.12
7	1	0	15.06	0.94	0	0
7	1	42	12.35	0.8	17.44	0.13

Soil Sample Analysis Sheet

Name: Jen Royce
Site: Naples Truck Stop
Sampling Date: November, 1998
Procedure: Dehydrogenase and β-glucosidase analysis

Site #	Replicate #	Incubation Time (d)	Dehydrogenase Activity μg TTF g^{-1} soil	β-glucosidase Activity μg PNP g^{-1} soil
1	1	0	0.94	3.06
1	1	42	1.67	13.66
2	1	0	3.95	4.11
2	1	42	5.90	5.93
3	1	0	2.92	0.33
3	1	42	6.41	4.44
4	1	0	2.36	0.55
4	1	42	2.15	4.62
5	1	0	0.93	1.54
5	1	42	5.18	4.77
6	1	0	3.53	24.50
6	1	42	8.54	52.64
7	1	0	3.29	5.50
7	1	42	3.80	9.26

Substrates used to measure enzyme activity

Dehydrogenase activity: 2,3,5-triphenyl tetrazolium chloride (TTC)

Enzyme-cleaved product = triphenylformazan (TTF)

b-glucosidase activity: p-nitrophenyl-b-D-glucoside (PNG)

Enzyme-cleaved product = p-nitrophenyl (PNP)

USEPA ERT

CHAIN OF CUSTODY RECORD

COC # 3367-0003

REAC, Edison, NJ
Contact: Jennifer Royce
(732) 321-4200
WO#: 03347-143-001-3367-01
EPA Contract 68-C4-0022

Project Name: Naples Truck Stop
Location: Naples, UT
Site Phone:

Page No.: 1 of 1
Cooler #:8722
Lab: Oregan State
Contact: Joann Whalen

LAB #	Tag	Sample #	Location	Matrix	Collected	Container/Preservative	Analysis Requested	MS MSD	Comments
	G	3367-001	Location 1	Soil	11/2/98	32 oz glass/4 C	Microbiology		
	G	3367-002	Location 2	Soil	11/2/98	32 oz glass/4 C	Microbiology		
	G	3367-003	Location 3	Soil	11/2/98	32 oz glass/4 C	Microbiology		
	G	3367-004	Location 4	Soil	11/2/98	32 oz glass/4 C	Microbiology		
	G	3367-005	Location 5	Soil	11/2/98	32 oz glass/4 C	Microbiology		
	G	3367-006	Location 6	Soil	11/2/98	32 oz glass/4 C	Microbiology		
	G	3367-007	Fill	Soil	11/2/98	32 oz glass/4 C	Microbiology		

Special Instructions:
Microbiology = Nitrogen Mineralization, Microbial Biomass Carbon, Microbial Biomass Nitrogen, Dissolved Organic Carbon, Disolved Organic Nitrogen, Ammonia-nitrogen, Nitrate-nitrogen, CO2 respiration, Soil Enzymes - B-glucosidase, Dehydrogenase

QC: BAP

REFERENCE COC:

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All Analysis	Jennifer Royce	11/3/98									

APPENDIX D
Field Documentation
Naples Truck Stop Site
Final Report
April 1999

CONTENTS

PAGE NO.	REFERENCE	DATE

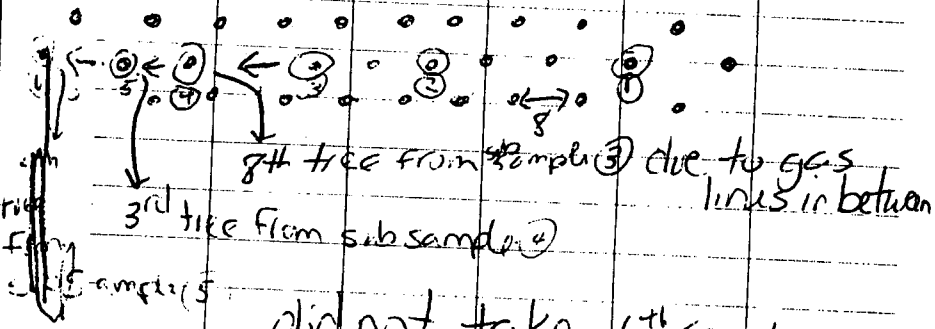
10/2/98

Loc 2

Trees planted rows of 3

[cement building]

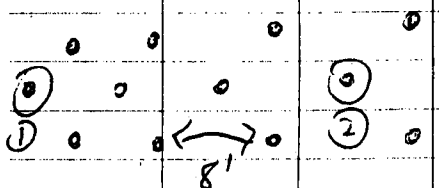
middle row 2nd tree
then 3rd tree after that
then tree next to that



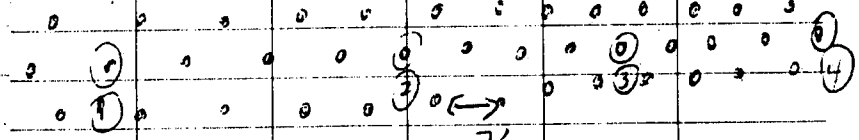
did not take 6th sample
underground obstruction

auger

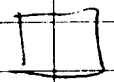
Loc 1 auger



Loc 4 auger

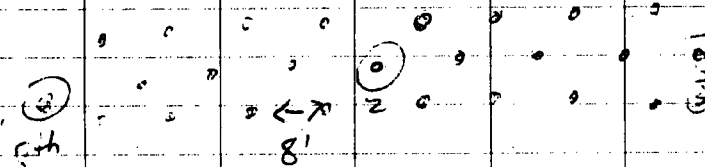


Q storage shed

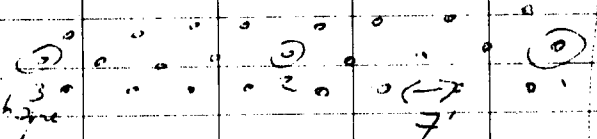


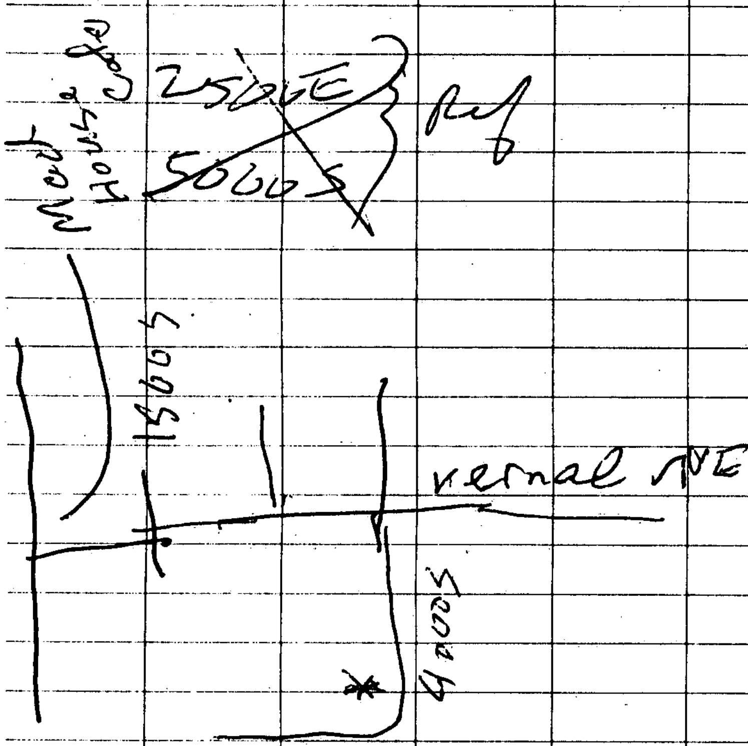
Loc 3

post hole digger



Loc 5




5000 S
1500 S
4000 S
vernal